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MUSCLES AND MEANINGS: A STUDY OF THE EFFECTS OF INDUCED TENSIONAL STATES ON THE CONNOTATIVE MEANING OF CONCEPTS

BY

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The undersigned certify that they have read, and recommend to the Faculty of Graduate Studies for acceptance, a thesis entitled "Muscles and Meanings: The Effects of Induced Tensional States on the Connotative Meanings of Concepts," submitted by George Gordon Manson in partial fulfilment of the requirements for the degree of Doctor of Philosophy.

ABSTRACT

This dissertation was designed to determine whether consciously executed changes in the tensional characteristics of skeletal muscle groups would evoke corresponding intensity and directional effects in the connotative meanings of concepts as measured by a semantic differential device.

Five different treatment groups, drawn from a freshman class in educational psychology, were required to rate each of five concepts on 12 semantic differential scales both before and after treatment. The five treatments incorporated the deliberate alteration of muscle tension states to achieve the following conditions: simulated pleasure, simulated rage, simulated terror, tightened neck muscles (a condition characteristic of many anxious persons) and finally, a phasic condition characterized by rapid alternation of facial muscles.

Analyses of variance procedures were applied to difference scores in order to compare mean rating shifts both among experimental groups and between each experimental group and a control. In addition, the data was analyzed to determine the extent to which the respective treatments both reduced homogeneity of variance and manifested treatment-associated directional trends in the post-treatment ratings. As a further check on the data, subjects submitted introspective reports in the effects of treatment.

The findings of the study were not as general as hypothesized. Evidence did emerge to show that some individuals, while under the influence of induced contraction patterns in the skeletal muscles will rate concepts differently from those subjects rating the same concepts under non-treatment conditions. The data also revealed that the magnitude of rating shifts is proportional to the intensity of the induced tensions.

It was judged that the results were sufficiently supportive of the hypotheses to suggest replication of the study and that error variance might be further reduced by correcting for initial differences in initial baseline tension states among subjects.

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CHAPTER 1

STATEMENT OF THE PROBLEM

While it is today clearly established that the activity of the skeletal muscles is one of the concomitants of emotional behavior, its precise role has not been adequately described. Yet, as long ago as 1926, Perry (1926) pointed to the distinctive part played in affective behavior by the proprioceptive patterns "making up the 'motor set' of the expression." Jacobson (1938) and, more recently, Wolpe (1962) have shown, citing the evidence provided by psychoneurotic behavior, that progressive relaxation of the skeletal musculature produces a decrease both in muscle tone and in emotional disturbance. A related commonplace belief may be cited here as well; namely, that the assumption of an attitude or pose frequently helps to establish the emotional state which the behavior expresses.

It is also generally accepted today that man should not be viewed separately as an acting, thinking, or emotional organism; rather, his actions, thoughts, and emotions together form that integrated complex of processes we call behavior. Any accumulation of experimental findings concerning the strictly neurological, physiological, or psychological aspects of emotional processes must ultimately recognize this interrelatedness. Hence, an emotion is not

to be equated merely with the backflow of impulses; neither is emotion to be equated solely with the observable expressional events designated as joy, sadness, or anger.

Various theorists have recognized the ramifying nature of the emotions and in their theories have conceived of a sequence of integrated bodily events which culminate in emotions. Magda Arnold (1960a, 1960b.) belongs to this group; she thinks of an emotion as a consequence of perceptual and cognitive activity which, through integration, results in the communication of stimulus data and the appraisal of these data according to their worth to the organism. The consequence of this appraisal is, in her view, the experience of emotion and this in turn gives rise to the well known variety of covert and overt expressional events.

The physiological and neurological events which underlie emotional expression are of interest here. It has been clearly established that the manifestation of emotions is tied to the generally opposite operations of the sympathetic and parasympathetic divisions of the autonomic nervous systems. These two systems have contrasting functions and the organs which they serve are innervated by both systems, that is, are excited by the sympathetic division and inhibited by the parasympathetic. For example, in both fear and anger, there are increases initiated by the sympathetic division in: respiratory rate, blood pressure,

blood sugar concentration, muscle tension, and perspiration. At the same time, an increase in the activity of the parasympathetic division initiates the inhibition of intestinal movements and decreased flow of blood to the brain and skin. However, in the milder emotions of joy, sorrow, and disgust, the two divisions reverse these roles.

The activity of the muscles, interestingly enough, is governed by both the autonomic and the voluntary nervous systems. Under the influence of fear and rage the autonomic system (sympathetic division) initiates increased tension; under joy, sorrow, or disgust, the muscles are comparatively relaxed. However, some variability in tension states is also a function of conscious intent: individuals are able to tense the appropriate skeletal muscles required to push a car out of a ditch; likewise, individuals can relax muscle groups in the preparation for landing from a fall.

Posture, which may also be regulated by conscious intent, is often described as a <u>tonic</u> state, in reference to sustained muscular contractions which are the result of the component muscle fibres being activated in sequence. In this tonic, tension state the motor discharge from fibre endings is asynchronous. On the other hand, bodily movements of limbs, trunk, and facial features, involve what have been called phasic muscle contractions. In contrast to tonic or postural contractions, these are characterized by synchronous

activation of muscle fibres and irregular discharge from the fibre endings. (See Gardner, 1963)

THE PROBLEM

Now, both types of muscle contractions are amenable to conscious as well as unconscious control and both are correlated with various emotional states. These facts led Gellhorn (1964)to propose that cognitively mediated alterations in muscle tension must be accompanied by associated alterations in emotional behavior. This hypothesis provides an interesting point of departure for psychological investigation. The author has translated it into the following statement of problem:

If changes in muscular tension are integrally tied to the evocation of emotional states, should not consciously induced changes in both tonic and phasic muscle activity result in changes in the connotative meanings assigned to perceptions?

IMPORTANCE OF THE STUDY

An answer to this question is of more than theoretical importance, as is illustrated by the following comments:

1. A positive finding would imply that human beings with the help of training and practice, can modify their emotional responses to suit objective contextual demands.

2. A positive finding would imply that muscle tension levels can be consciously modulated to produce maximal efficiency in task performance. This implication also emerges from the findings of Bourne (1935), Courts (1942), Deese (1962), and others, who have investigated the relationship of task performance to the tensional characteristics of individuals. These findings are generally in agreement that, insofar as the performance of motor tasks is impaired, there appears to be an optimal level of tension above or below which the performance of certain given motor tasks is impaired, and that the optimal level varies for different tasks. In addition, Meyer (1953) has shown that optimal tension level varies according to the stage of learning, that is, induced muscular tension early in learning is facilitative in its effects on task performance, whereas in later stages the same level of tension is detrimental to efficiency. These findings should not be surprising; for example, experienced golfers are quite aware that a relaxed swing usually results in a good drive and, moreover, do utilize their capacity to modulate muscular tension accordingly.

CHAPTER 11

REVIEW OF THE LITERATURE

The position taken in this study is that proprioceptive discharges contribute to the physiological processes underlying emotional behavior in two ways: first, the posture of the body, expressed as a total quantity of proprioceptive impulses impinging on the posterior hypothalamus per unit of time, determines the setting of the hypothalamic balance; second, the facial contraction patterns maintain a flow of different discharges via the hypothalamic-cortico system and these interact with facial cutaneous impulses in the cortex. (After Gellhorn, 1964). The author reasons from these assumptions and the statements made in Chapter 1, that since posture and facial expression are subservient to voluntary as well as involuntary control, emotional behavior may be amenable to conscious alteration of both tonic and phasic muscle patterns. Accordingly, it is intended in this chapter to present the theoretical and experimental evidence contributing to a reasonable overall hypothesis.

THE NEED FOR A SYSTEMATIC STUDY OF EMOTION

Now, emotions are viewed by psychologists as extremely complex phenomena. They can exert powerful motivating effects on behavior and they can bring strong influence to bear on

perception, learning, and performance. The complexity of the emotional process, as Lindsley (1951) points out, arises from its extensive organismic involvement at many levels of neural and chemical integration.

Lindsley's statement clearly anticipates the state of confusion that exists in a discouragingly disordered area of study. English and English (1958) make a comment, in their dictionary of psychological terms, on the virtual impossibility of defining emotion except in terms of conflicting theories. And Rapaport (1950, p.5) writes:

> The main difficulty in the literature of emotions appears to be that the word emotion is sometimes used to designate a phenomenon, and sometimes to designate the dynamics underlying a phenomenon or group of phenomena.

And, again, Leeper (1948), approaching the problem from a different vantage point, suggests that the contemporary difficulties in reaching a common basis of understanding of emotions, arise from the traditional representation of cognitive, affective, and conative processes as separate, autonomous elements in behavior.

Some Problems which Confront Theorists

The lack of harmony among the various viewpoints about emotions arises also from the wide divergence among investigators about both topics of study and preferred methods of investigation. One consequence of the highly specialized

interests in this field of study has been that many investigators, in exploring particular facets of emotional behavior, have failed to broaden their conceptual framework sufficiently to accommodate and integrate their assumptions and findings with the known theoretical and experimental data about emotions. To put it simply, it must be acknowledged by psychologists, physiologists, and neurologists, for example, that an emotion is greater than the sum of its parts; that an emotion is not just simply conflict, or a form of energy, or certain visible overt behavior states, or conscious experience, or proprioception.

The task presently confronting this writer is to establish a conceptually broad frame of reference in which to scrutinize the proposition that consciously mediated tensions in the skeletal muscles influence emotional expression. This frame of reference must, desirably, incorporate data about emotions concerning which there is general agreement. Since the prevailing lack of harmony among viewpoints suggests that such a prospect is at best limited, then the experimental design proposed by the writer must be organized to obtain the most adequate approximation to an arbitrary frame of reference.

A Proposed Specification of Emotions

Arnold (1960, a,b), Hillman (1960), and Plutchik (1962) have each attempted to organize known facts and to

relate diverse observations in a theory of emotions. One outcome of their research endeavours has been to demonstrate that emotions can be described according to the following specifications:

(a) Dimensionality

The attempt to account for all emotions in simpler terms than the primary emotions themselves provide, has resulted in a number of suggested dimensions, each of which has proved useful in describing emotions.

(i) Intensity

Common experience recognizes that an emotion can be graded along a continuum ranging from a low to a high level of activity, for example, terror, fear, and apprehension. Numerous investigators have also agreed that intensity constitutes one dimension of an emotion; among these investigators are Block (1952), Schlosberg (1954), and Lindsley (1951) who refer to intensity under the heading of activation. Malmo (1957) produced experimental evidence that emotional intensity (or arousal, as he prefers to call it) can be measured by muscle potential gradients and by level of palmar skin conductance.

(ii) Quality

It is presently recognized that emotions cannot be described solely in intensity terms; the criterion of quality must be invoked. Block (1957) applied semantic differential technique to the isolation of the dimensions of emotion and

inferred the existence of both an intensity and a pleasantness-unpleasant dimension. The notion of a pleasure-pain factor has appeared in other approaches as well (see Schlosberg, 1954; Stagner, 1948).

It is important to note, however, that the factors of intensity and quality may interact. It has been noted, for example, that small doses of certain drugs, for example, strychnine and adrenaline, produce beneficial effects whereas large doses are harmful. Ax (1953) recognized that differences in arousal level were associated with differences in reactivity when he demonstrated that, for a given level of arousal, fear and anger were qualitatively different emotions. In related, rather more specific terms, Gellhorn suggested that fear may be distinguished from anger in terms of the degree of hypothalamic excitation. He suggested further that a change from fear to rage is not solely the result of an increasing

> firing rate and an increased number of discharging neurons but also of an alteration in the pattern of discharge that is related to the change in tone and activity of the striated muscles. (Gellhorn and Loofbourrow, 1957, p. 374).

(iii) Persistence

Emotions would also appear to be distinguishable in terms of their persistence through time. One may thus distinguish between anger which swiftly runs its course and chronic resentment. To illustrate: Selye's (1950) investigation of the general adaption syndrome reveals that the

detrimental effects of stress are a function of the amount of time people are exposed to stress-evoking stimuli.

(iv) Purity

Various psychologists (Jorgenson, 1928; James, 1910; Williams, 1956) have argued that emotions may conveniently be represented as a spectrum of infinite gradations of response along which certain clusters, labelled as joy, fear, anger, and so on, could conveniently be identified as possessing specific attributes. Plutchik (1962), who also employs the analogy of the colour spectrum, has postulated the existence of a number of pure, primary emotions, for example, joy, fear, anger, and a large number of secondary emotions, for example, pride, curiosity, shame, created from the primaries by a process of synthesization.

There remains some controversy concerning the purity of emotions and this arises in part over the question of whether we can accurately recognize emotions in others. The traditional position taken by the mentalists would, for example, suggest that emotions are pure; they argue that accurate recognition is possible. The behaviorits, on the other hand, have denied such a possibility, largely on the evidence provided by the experimental studies of Landis (1924), Fèlèky (1914), and others. These investigators concluded that, because of wide individual differences among specific emotional response patterns, and also because

of the "conventionalized modes" of expressing emotions, accurate recognition is impossible. Wolff (1943) has likewise shown that individuals express emotions in quite individualistic ways.

These findings do not really refute the assertion that emotions are pure, unitary entities. Their real unitary nature may, for instance, be camouflaged by the effects in emotional expression of social convention and idiosyncratic facial patterns. This position is supported by Murray (1964) who reports evidence provided by cross-cultural comparisons and observations of the blind and deaf. He describes people the world over as sharing a basic "core" of similar emotional expressions and suggests that, over this core, there is developed an overlay of learned expressional characteristics.

(b) Individual differences

That individuals reveal differing emotional responses to a given stimulus situation has been demonstrated experimentally by Funkenstein (1957). In his study, randomly selected college students were shown to react in three ways to a frustrating task: some showed fear, some directed anger reactions towards the experiments, and some turned their anger inwards. The outer-directed anger reactions correlated with noradrenalin secretion and both the inner- or self-directed anger and fearful reactions correlated with adrenalin secretion.

Drug studies have revealed individual differences, often of a dramatic nature, in response to drug administration. Under the influence of drugs which typically produce exciting effects, some individuals become quiet. Alcohol also produces widely diverse reactions, as revealed among individuals who, while "under the influence" become either belligerent, or depressed, or elated.

This section of the chapter has pointed out some terms of reference for the study. The necessity for establishing a set of theoretical and experimental guidelines arises from several considerations: first, the nature of the topic under study (proprioception and its relation to emotional behavior) requires that some attempt be made to establish a proper perspective within the immense and formidably complex area of emotions; second, the disordered nature of emotions as a field of study requires that some attempt be made to organize the pertinent, multidisciplinary findings about emotion into a coherent body of knowledge expressed in comprehensible terms.

The remaining sections of the review, in addition to setting the stage for the presentation of a set of testable hypotheses, should contribute further to an organized statement about emotions.

THE PSYCHOLOGICAL ASPECTS OF EMOTIONS

The Three Classical Views

Magda Arnold (1960 a, 1960 b) has written a comprehensive two-volume work in which she surveys the area of

emotions and attempts to restore some order to a disordered domain. In commenting on the problems encountered in the past concerning the perplexing relationships which exist among a perceived object, the emotional experience, and overt response, Arnold (1960a) refers to the three classical solutions which have been advocated:

1. That perception arouses emotion which, in turn, causes bodily changes. This sequence was proposed by Aristotle but was developed largely on *a priori* grounds.

2. That perception induces bodily changes and these are felt as emotions. The most famous of the adherents to this proposed sequence of events were James and Lange.

Cannon (1927) dealt this view a mortal blow when he demonstrated that animals and patients who have had the neural connections severed between viscera and brain still show rage, fear, and other emotional reactions.

3. That perception arouses both emotions and bodily changes. McDougall (1926) held that instincts and emotions are always combined, that is, the object which arouses the instinct simultaneously evokes the emotion.

There are certain weaknesses in McDougall's theory. He explained emotional arousal, for instance, by attributing to objects an innate power to trigger instinctive patterns of behavior. (Today the prevailing view is that the organism bestows meaning on perceived objects). McDougall also limited the explanatory power of his theory by

aligning certain instincts with certain emotions and this explains, not only his long list of instincts, but his failure to recognize all emotions, for example, desire, since he could not identify a corresponding instinct.

Several Modern Views

To the earlier traditional conclusions about emotions, cited above, one can add the new support emerging from several of the more recent investigations:

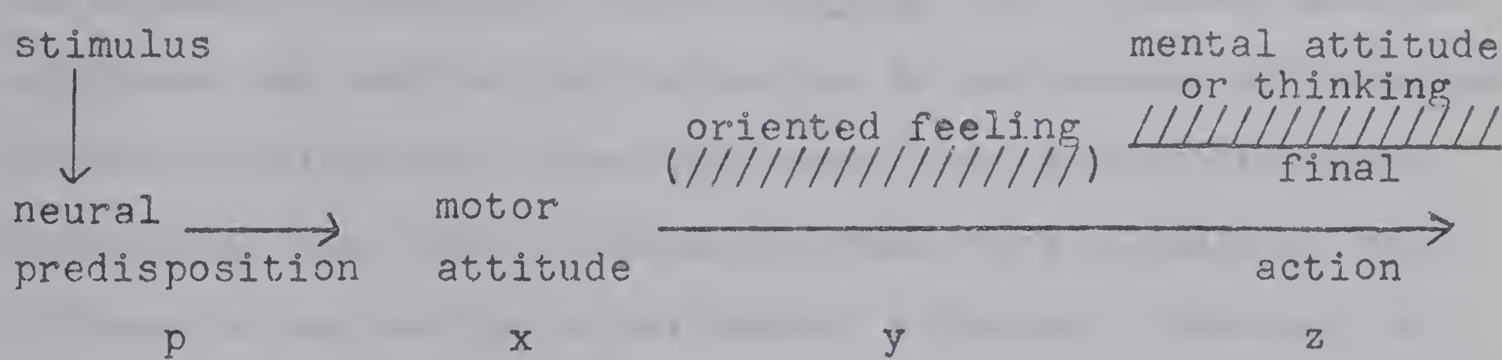
(a) Nina Bull

Bull's attitude theory divides the expression of emotion into two parts, a "fixing-to-go" kind of preliminary body set or posture and a subsequent activity or movement. She hypothesizes that a perceptible delay occurs between the preparatory body attitude and the ensuing overt activity, the gap being filled by feelings of emotion and associated mental attitude. Bull's formulation has relevance for the hypothesis presented in this study since she contends that the particular kind of action prepared for specifies the kind of feeling that follows, that is, the motor set of preparing to hit out at someone elicits anger.

Bull also states that this postural preparation, including facial behavior patterns, is accompanied by appropriate visceral changes and that the sensation of these changes, plus proprioceptive feedback from the postural state, plus the original exciting stimulus, evokes the

experience which we designate as emotion. (See Figure 1). The similarity to the James-Lange Theory is apparent; however, while James and Lange believed that bodily changes preceded emotion and were the cause of it, Bull contends that an action follows a postural readiness to express that action, saying, for example, that sorrow follows upon a readiness to cry and not actual crying. Indeed, as she points out, one tends to feel less sorry when one begins to cry in earnest.

The preparatory motor act exists beforehand as a latent tendency in the form of a neural predisposition and thus exists below the threshold of consciousness. Whenever this readiness to act is released by whatever restraining mechanism contains it, an emotion arises.



Key: Solid black line denotes continuity of response

p - predisposition or latent attitude, existing as a neural organization or schema
x - preliminary motor attitude
y - the attitude continued, giving off afferent nerve impulses (slanting lines)
z - final action

FIGURE 1

The sequence of events in emotion (after Bull, 1945, p. 212).

Bull's theory is interesting in other respects: she accounts for varying intensities in feeling and emotion by suggesting that in low grade emotion the associated feelings obtrude upon consciousness only as a vague form of excitement, restlessness, and anxiety, since they lack an acequately oriented cognitive component to give them full meaning. In other words, emotions (as opposed to feelings) require clearly defined stimulus situations as necessary conditions for expression.

In summary, Bull distinguishes among the following: the neural organization which determines emotional expression (that is, the motor attitude); the felt attraction to or repulsion from the exciting stimulus object which exists as a mental component; and the action that follows upon the attitude and emotion and which can be influenced by thinking. Unfortunately, while the hypothesis that motor attitude determines the felt orientation seems very plausible, Bull offered no supporting experimental evidence. However, an experiment conducted by Pasquarelli and Bull did reveal the following important finding:

> A series of hypnotic sessions was conducted in which a specific postural act (emotional act) was first induced and then locked (hypnotically fixed), after which a contrasting affect was suggested. *There was repeated demonstration of the dependence of affect on bodily changes, those in the realm of postural set being particularly marked.* (Italics in the original). Without changes of some kind no new affect of any kind was obtained, neither the contrasting one suggested by the hypnotist, nor any

> other; the primary affect in every case was either maintained directly or definitely augmented. (Pasquarelli and Bull, 1951, p. 521).

Arnold (1960a) argues that the conclusion reached in this experiment might be invalid since the effect of "locking" the motor attitude, if felt as an orientation to or away from a perceived stimulus, may freeze the entire action tendency, thereby blocking the experience or expression of any other emotion.

The countering argument would appear to be that Arnold possibly did not read Pasquarelli and Bull's report with due care, since they clearly state that, while "no new affect was obtained . . . . *the primary affect in every case was either maintained directly or definitely augmented*" (italics not in the original) (*Ibid*., p. 521)

Now, the criticism posed may also be countered quite legitimately by proposing that "locked in" motor attitudes do not directly freeze action tendencies and, in turn, emotions; rather, through blocking the experience of any *other* emotion, a locked in motor attitude may *indirectly* freeze action tendencies. Arnold's criticism therefore contradicts her own theory since she locates emotion before action in her proposed sequence of events.

(b) Gemelli and Michotte

Gemelli (1949) and Michotte (1950) adopt a view similar to that of Bull regarding the sequence of events

in emotion. Like Bull, they see the action tendency organized as a neurological pattern; however, where Bull speculates that the mental attitude follows the activated motor attitude, both Gemelli and Michotte contend that activation occurs only as a result of a psychological appraisal by the individual of the stimulus interaction. They assert that emotion can only be understood as a functional phenomenon which emerges from consideration of the perceived special relationship between the object and its perceiver and which gives rise to the appropriate behavior tendency.

The theories of Gemelli and Michotte are incomplete since they fail to describe and explain all three aspects of emotion: experience, expression, and action. The significant feature of their theories is, however, that they equip organisms with some means of appraising stimuli.

The Theory of Magda Arnold

The one remaining point of view to be considered here is the view of Magda Arnold (1960a, b). In common with her predecessors, she emphasizes the sequential elements of emotion, expression, and action, but Arnold, in addition, has drawn attention to the importance of the initial perception. She reasons that, since every perception does not result in emotion, organisms must possess some means of appraising each perceived situation as it arises. The total basic sequence of events envisaged by Arnold is then as follows:

(a) Perception

Both perception and emotion require some object referent; however, an object is known in different ways insofar as these processes are concerned. The function of perception is simply the communication of sensory data about the object perceived. The stimulus entity may be actually present, or exist as a memory, or as an anticipation, or as something imagined. The experiencing of an emotion requires not only a reference to some object or other entity, but also to some awareness of the significance of the object or other entity for the experiencing subject.

(b) Appraisal

An individual must, moreover, appraise the worth or harm of a perceived object as a prerequisite to the experiencing of an emotion. In Arnold's view, appraisal is conceived as

> a process of evaluating and comparing sense impressions from many sense modalities and thus may take an appreciable time. But once a thing is evaluated, the experience of liking or disliking it follows immediately and automatically. It is a momentary experience, as fleeting as sensation, even though it may endure if the process of appraisal continues, or may even change as different aspects of the situation are assessed. Appraisal is a unitary function of which we may be aware when it is prolonged (for example, in deciding whether we like the taste of a new drink), but of which we may also be completely unaware when it is immediately followed by emotion (for example, as seeing a snake and getting scared). (Arnold, 1960b, pp. 33-34).

Arnold implies that appraisal must be distinguished from emotion since some appraisals are the results of

cognitive processes, whereas emotion clearly is a <u>felt</u> directional pull to or away from something. Arnold saw the appraisal function as an automated response tendency which is instinctive or learned and which occurs directly, immediately, and intuitively upon the perception of a stimulus. The judgments performed in appraisal by lower animals and young children are designated by Arnold as "sense judgments" (p. 175), as opposed to reflective judgments, the purpose of which are to bestow meaning on sense data. Beyond early childhood, both intuitive and reflective appraisals operate in sequence or in conjunction, as in the instance of seeing a vague shape in the woods at night; the first direct, immediate appraisal or scanning renders the estimate that the object is dangerous; however, following the reception of additional sensory data and a different, reflective appraisal, the object may be judged harmless.

This concept of appraisal is not unique; for example, Bruner, Goodnow, and Austin (1961) propose that by means of a generic coding of experience, people are enabled to make sense out of their experiences. Miller, Galanter, and Pribram (1960), in similar vein, postulate the existence of an Image which functions, among other things, as an evaluator of sensory input. There is also neurological evidence to give support to these views, and this will be discussed in a following section.

(c) Emotion

This is the felt tendency to approach or withdraw

from a stimulus situation. The different emotions are the results of different appraisals; each emotion is a consequence of a different relationship to the object, each is associated with a different kind of emotional experience, and each leads to a different action.

Arnold stated that an emotion is an impulse to action and that it invokes a set of physiological changes which function to aid and abet the given, specified action tendency. Anger, for example, is associated with the urge to action, to release pent-up tension. Different emotions specify different actions and for the most part involve, as Dumas (1932) suggested, different patterns of physiological change.

Arnold contended that the patterns of physiological change are characterized by inter-individual differences and similarities; there is, first of all, a common core apparent among given patterns of change which permits people to recognize emotions in others and, second, the idiosyncratic qualities of expression which vary from person to person. Furthermore, the tendency to act antedates the physical disturbance, and hence the experience of emotion is to be distinguished from its expression.

Many theorists distinguish between emotions and feelings; however, there are few experimental findings that demonstrate the difference between the two states. Gemelli's (1949) study represents an exception; he concludes that feelings are reactions to sensations elicited by some single

aspect of a stimulus situation and sensed by a single modality, for example, the reactions to hunger, heat, sustained posture. Emotions, on the other hand, are aroused by an object or situation as a whole and may be viewed as reactions to an object or situation in relation to the self, and may involve (as in complex emotions) more than one sense modality, for example, reactions to a snake, a Sweepstake victory, missing the last morning bus to the office. Gemelli also concludes that feelings, that is, reactions to sensations, usually precede emotions.

Arnold thinks that, in some respects, feelings and emotions are very similar: both, she stated, are based on intuitive estimates and both permit description in terms of varying intensity and quality. She believes that feelings and emotions differ in the respect that whereas feelings only arise from some specific aspect of a situation, emotions are aroused by the situation as a whole.

(d) Expression

This is the pattern of physiological changes organized for approach or withdrawal, differing for each emotion, which accompanies the felt tendency. Hence, a person who experiences fear may become aware of an increase in heart rate, tremor, and fatigue. However, the fear may not be recognized if the individual is fully occupied, as for example, in the case of a mother running for her child who has wandered on a busy street. In such an instance awareness of the physiological

changes may be delayed until the mother has safely rescued her child. The importance of drawing attention to this delayed reaction is that an individual also appraises the physical changes that come with emotion, and this appraisal will in turn be followed by an emotion. For example, a man may become angry on recognizing symptoms of fear, or in the example previously cited the mother may wrongly judge the symptoms of fear as an indication of illness, since at the given crucial moment she was too busy to know she was afraid.

(e) Action

Approach or withdrawal occurs until another emotional sequence intervenes.

The Basic Emotions

Viewed in Arnold's (1960a) terms, the *quality* of an emotion depends on how an individual appraises a stimulus situation while the *intensity* of an emotion depends on the extent of the effect of the situation on an individual. Now, according to Arnold, a stimulus situation can be appraised in three ways: according to its benefit or harm, according to its presence or absense, and according to its ease or difficulty of confrontation (or avoidance). Emotions that occur as a reaction to these basic conditions are basic emotions. Further, the reactions towards these conditions tends usually to show direction towards or away from an object, hence the basic emotions may be classified also as *positive* or *negative*

emotions. Also, accordingly to the degree of impulsion toward or away from an object, emotions may be classified as impulse or contending emotions. (See Table 1 for a further illustration of this two-fold classification).

Simple and Complex Emotions

Arnold (1960a) refers to a simple emotion, for example, love, fear, and each of the other basic emotions, as the reaction to appraisal of a given stimulus object (or other entity) under a single aspect, that is, direction to or away from the stimulus item. (Simple emotions are not to be confused with feelings which, according to Arnold, do not involve appraisal.)

A complex emotion, on the other hand, is viewed by Arnold as a compound of many simple emotions, all directed toward the same stimulus situation but aroused by various and often conflicting aspects of the stimulus situation, for example, jealousy may contain love, fear of loss, anger toward a loved one (or interloper), plus other emotions. The more complex the situation the more ways in which it can be appraised (presumably because component elements involve separate appraisals), hence the more varied will be the emotional complex. Complex emotions are hard to describe because it is difficult to identify and to give accurate account of shifting emotional experiences and modes of expression or to know how a stimulus situation is being appraised from one moment to the next.

TABLE 1

THE BASIC EMOTIONS CLASSIFIED ACCORDING TO DIRECTIONALITY AND DEGREE OF IMPULSION (Adapted from Arnold, 1960a, p. 196)

		Direction of Emotion			
	Result of appraisal of stimulus	Toward (whether present or absent	Toward absent object	Toward present object	Kind of emotion
Impulse emotions	beneficial	love liking	wanting desire	delight joy	positive
	Harmful	hate dislike	recoil aversion	sorrow sadness	negative
Contending emotions	Beneficial and judged attainable	-	hope	-	positive
	Beneficial and judged unattainable	-	hopelessness, despair	-	negative
	Harmful and to be overcome	-	daring, courage	anger, desperation	positive
	Harmful and to be avoided	-	fear (terror)	dejection	negative

Episodic and Enduring Emotions

According to Arnold, the emotional reaction to a given stimulus entity may leave as a "residue" (p.198) either a transient emotional tendency or an enduring one, that is, emotional attitude or emotional habit. Furthermore the episodic acting out of an emotional attitude may generate an enduring emotional state and this response may generalize to a whole class of objects, persons, or other entities. It is important to note, however, in speaking of emotional habits or attitudes, that Arnold referred to the effects of the emotions, not the emotions themselves.

In summary: Arnold's theory is the outcome of a thorough, scholarly evaluation of the theoretical and experimental findings from a wide variety of sources. Several of the theorists who influenced her ideas have been cited here, for example, McDougall, Bull, Dumas, Gemelli, and Michotte.

It cannot be said of Arnold, however, that she has produced a synthesis of the conflicting views about emotions since she is a mentalist who relies heavily on the reported experiences of individuals as a source of primary data for her psychology of emotions. Yet, having identified the functions which contribute to her proposed sequence of events in emotional behavior, she then endeavours to locate the neural structures which mediate those functions. (Some discussion will be directed in a following section to the neurological underpinnings for her appraisal system.)

Arnold's theory has been given some priority of attention for the reasons that, first, her theory is judged by this writer to represent the most systematic of the recent attempts to depict emotion in all its facets; second, the concept of appraisal has a useful function to serve in the elucidation of the effects of proprioception in the attachment of meaning to stimulus input. If, for instance, subjects in an experiment are assigned a neutral concept to rate under normal circumstances, it is quite reasonable to suppose that the ratings should reflect this neutrality of effect. Now, suppose that subjects are required to rate a neutral concept under a condition in which they simulate the muscle tension patterns characteristic of a given emotion. This condition then, would constitute an additional sensory input to appraise and, if Arnold's proposed sequence of events is to be believed, the results of this second appraisal will be expressed as a felt tendency to or away from the simulated condition. It may also be supposed, since the assigned task of rating concepts is being carried out concurrently, that the felt tendency toward the treatment condition, whether negative or positive, should generalize to these concepts.

THE NEUROPHYSIOLOGICAL ASPECTS OF EMOTION

A brief excursion into the realm of neurophysiology is necessary in order to examine several of the structures and processes of the central nervous system which are involved in emotional behavior. The evidence would suggest that certain

structures seem to play more important roles than others; however, one is reminded of the caution voiced by Herrick concerning the interrelatedness of central neural processes. He states:

> It is very important to recognize that all levels of integration interpenetrate, and one can never operate independently of the others. Each higher phylogenetic level is derived from the lower and can work only with the instrumentation provided by the lower levels. (Herrick, 1956, p. 253)

Obviously, every psychological experience is mediated by some neural structure and, in that case, one can more than reasonably expect that there are specific brain structures which mediate, for instance, the various events in the "emotion sequence" proposed by Arnold, that is, perception-appraisal-emotion-expression. However, the available supply of neurophysiological answers to psychological questions is, as yet, limited. The complexity of neurological processes, as Herrick's statement would imply, appears to transcend even psychological complexities and, here again, one is confronted with a situation in which theoretical speculation outpaces experimentally-based fact.

In order to relate neurological to psychological functions in an understandable manner, the following discussion will relate the steps in the sequence of emotion as Arnold (1960a) envisaged them to be. Briefly, the steps are, one recalls:

- Something must be perceived before it can be wanted feared, disliked.

- What is perceived is evaluated immediately, directly, and intuitively in terms of its effects on an organism, before emotion can be experienced.
- The outcome of appraisal depends on relevant past memories as well as on present circumstances.
- The differing emotions arise from differing evaluations, that is, each emotion supposes a unique relationship to the stimulus and this unique emotional experience is characterized by a unique response.

If the emotional drama unfolds in the manner suggested, the actual neurophysiological correlates of these events should eventually be capable of demonstration. It is not within the legitimate scope of this chapter to report and evaluate the mass of findings that Arnold has recruited in support of her theory. However, one must consider that the appraisal concept does require elucidation at neurological levels.

<u>The Estimative System</u>

Arnold bases her argument in favor of the appraisal concept on the conceptualization in neurological terms of an estimative system. A simplified account of the system may be stated in the following terms: afferent connections from the sensory receptors to the reticular system, together with certain thalamic nuclei, and the cortex of the limbic lobe, form the major linkage within the system. Sensory input somehow activates the system so as to mediate an appraisal of the impact as pleasant or aversive.

The existence of identifiable pleasure and pain loci

have been supported by recent evidence. In this respect the work of Olds and Milner (1954) may be cited: after he and his associates implanted electrodes in the anterior hypothalamus and adjoining areas of the limbic system, rats, cats, and monkeys appeared to find electrical stimulation rewarding. In addition they found that if the electrodes were transferred to more posterior areas of the limbic system, animals learned to rotate a wheel to terminate electrical stimulation. Olds concluded that both pain and fear were related to processes in the rear portion of the limbic system.

Theoretical Viewpoints of Ernst Gellhorn and Others

In Chapter 1 of this study reference was made to the apparently distinctive role enacted by the skeletal muscles in emotions. Various psychologists (Jacobson, 1938; Wolpe, 1962) were reported to subscribe to the hypothesis, supported by their therapeutic practice, that progressive relaxation contributes to decreased muscle tone and reduced emotional disturbance for psychoneurotic patients. Gellhorn (1964), seemingly alone, has taken the matter somewhat further; not only did he express the belief that altered muscle patterns results in altered emotional behavior but he also recruited a body of neurological fact and theory in support of the hypothesis. Pertinent sections of this evidence are reported as follows:

(a) The role of the hypothalamus in emotional behavior

Lindsley (1951) states that the neuro-physiologic focus of emotion is both intricate and diffuse and not to be localized in any specific functional system. However, to state that emotions feature extensive involvement of the nervous system is not to state that specific areas of the nervous system do not perform specialized functions. Papez (1937) has pioneered the view that, while emotional expression is usually cortically initiated, it can be aroused as well by sensory impulses travelling via the hypothalamus en route to the cortex. MacLean (1949) identifies the role of the limbic system with that of a visceral brain, describing it as a correlation centre for those sensations which relate to the survival of the organism, namely, feeding, fighting, fleeing, and mating. MacLean has assigned to the hypothalamus responsibility for imbuing sensation with emotional colouring and regulating the operations of the autonomic nervous system. He also notes the role of cortical functions in emotion and contended that the relationship between hippocampus and cortex was such that cortical messages were assigned priority. Indeed, both Papez and MacLean argue in their discussion of the role of the cortex, that the prior and necessary condition for the experience of an emotion was that sensory input be integrated and analyzed.

The writer wishes to direct attention to the role of the hypothalamus in emotional behavior since, according to Gellhorn (1957), there is in emotional activity, an estab-

lished linkage between proprioceptive impulses and the activity of the hypothalamus and in particular the posterior hypothalamus. Moreover, according to Gellhorn and Loofbourrow (1963), the hypothalamus is responsible, among other activities, for the maintenance of equilibrium between the parasympathetic functions of the anterior hypothalamus and the sympathetic functions of the posterior hypothalamus.

Through diffuse conduction the posterior hypothalamus produces certain crucial effects on the operation of the cerebral cortex, such as governing, for instance, the state of wakefulness. In addition, there is an interaction between cortex and posterior hypothalamus which often is reciprocal: for example, corticofugal discharges enhance the excitability of the posterior hypothalamus and this effect in turn determines the degree of corticofugal discharge to hypothalamic and other lower levels (Gellhorn and Loofbourrow, 1963).

This capacity of the posterior hypothalamus to increase the reactivity of the projection areas of the cortex to specific afferent stimulation and both reciprocally and potentially to produce profound effects on the excitability of the posterior hypothalamus suggests that disturbances in behavior may attend alterations in hypothalamic excitability. Gellhorn (1957) proposes that an understanding of the operation of this partnership between cortex and hypothalamus has the practical implication that psychotherapy may be directed to the alteration of hypothalamic functions.

Before proceeding to a closer examination of the relation between proprioception and hypothalamic function, it is necessary to say something about the relationship between the reticular system and the hypothalamus. Arousal and emotional behavior do not trace their origins solely to the functioning of the reticular system; rather, they seem to originate in the activity of the visceral brain as a whole. Gellhorn and Loofbourrow (1963) argue, on the basis of limited experimental evidence, that a crude form of arousal is maintained through the activities of both reticular system and hypothalamus and that the finer degrees of attention characteristic of perception and cognition derive from the interaction between cortex and brain stem. The significance that a consideration of the arousal system holds for the understanding of the role of proprioception in emotion resides in the observation that the transition from arousal to emotional reaction is gradual. This led Gellhorn (1964) to postulate that the arousal system functions to tune up the mechanisms involved in emotional behavior.

(b) Proprioception in relation to the excitability of the hypothalamus: the effects of emotional behavior.

Proprioceptive discharges appear to influence the psychological processes underlying emotional expression in several ways:

(i) Hypothalamic balance is influenced by the tonic activity of the skeletal muscles, that is, by the posture of

the body. Expressed in quantitative terms, this is to say that hypothalamic balance is altered according to the number of proprioceptive impulses received per unit of time. (Gellhorn, 1964). He cites empirical evidence to show that postures of the body associated with sadness or depression and moods that reflect body tonus associated with sadness are equated with a correspondingly reduced intensity of proprioceptive impulses, resulting in a shift of the hypothalamic balance from posterior sympathetic to anterior parasympathetic divisions and, in addition, to the maintenance of this reduced intensity of discharge. From this, he hypothesizes that a happy mood may be equated with a correspondingly increased intensity of discharge, followed by a shift in balance to the more dominant posterior hypothalamus.

(ii) Gellhorn (1964) contends that a casual relationship exists between specific sensory input and affective behavior and he emphasizes the cruciality of the effects of proprioceptive impulse frequency on the hypothalamus. As an illustration, he points out that the reaction to a stimulus situation such as news of the demise of a loved one, but received while manifesting the haunty motor reactions of an assured, boastful individual, should be expected to result in the failure to strike the sad mood befitting the personal loss. Likewise, the maintenance of a posture associated with the news of tragedy, while listening to Beethoven's Missa Solemnis, might be expected to interfere with any expression of joy.

The evidence in support of this hypothesis, although scanty, is cogent. Reference is made once again by the writer to the case studies by Pasquarelli and Bull (1951) of hypnotic subjects. This experiment, it will be recalled, bore on the impossibility of eliciting depression when subjects had been instructed to maintain a fixed, "opposing" posture.

Additional supports for the Gellhorn position, though hypothetical in nature, include Allport's (1924) belief that the qualitative differentiation of one emotion from a like view has been expressed by Washburn (1928) who equates emotion with those muscular events which occur in situations of vital significance to the organism, for example, fleeing and mating. He describes such events as adaptive responses but admits that some muscular movements are maladaptive as in the example of the frustrated motorist who attacks his deflated tire with kicks and verbal abuse.

In summary, Gellhorn's hypothesis provides the neurophysiological rationale upon which this study is based. In general, he presumes that differing postural states (either tonic, or phasic, or both) produce changes in frequency of bombardment of proprioceptive impulses on hypothalamic centres. This in turn results in a shift in autonomic balance toward greater excitatory or greater inhibitory effects, via the arousal system, on the activities of the cortex. In addition, the changes in the intensity of hypothalamic discharge contribute to qualitative alterations in reactivity.

This writer's review of the literature has prompted him to wonder whether Gellhorn's hypothesis had been challenged by other investigators. It should be reported that, to the writer's knowledge, his hypothesis has, at this date, received no attention.

THE EVIDENCE FROM RELAXATION THERAPIES

Jacobson (1938) and Finley (1953) contend that neuromuscular patterns constitute the key elements of emotional expression. Both developed systems of psychotherapy founded on the idea that consciously induced alterations in muscle patterns can change emotional behavior. The basic technique consists in making the client aware of muscular tensions and then practising the progressive relaxation of specific skeletal muscle groups until he can relax any given set of muscles at will. Other techniques, for example, hot baths, muscle-relaxant drugs, games, and exercise are also employed but all are directed to the modification of muscular set.

Somewhat less well known are the mediative techniques of autogenic training (see Schultz, 1959); these again, are based on the hypothesis that emotion is closely tied to the postural set of the individual; change the set and emotion is changed, or even completely dissipated. The similarity of autogenic training to Jacobson's progressive relaxation therapy is rather marked. Schultz (1959) reports that, in proceeding from the generally accepted premise that physio-

logic and psychologic processes are interactive and interdependent, he designed a set of exercises which combined auto-suggestion and relaxation. Schultz had discovered earlier that certain effects were associated with the relaxed state; namely, a feeling of heaviness and warmth in the relaxed parts, abdominal warmth, and a cool forehead. These effects, plus the regulation of cardiac activity and respiration, became the goals of his training program. It is important to point out, as Jacobson also indicates, that the attainment of a maximally relaxed state requires considerable training. Example of autogenic training: A client directs his concentration toward maximal relaxation in the right arm, to the repeated accompaniment of the verbal formula: "My right arm is heavy." After several days, during which the treatments are repeated three times daily, the client reports clear sensations of heaviness and warmth (equated by Schultz with optimal relaxation). The formula and basic exercises are then revised to: "My right arm is heavy ... my left arm is heavy." Schultz claims his method to be successful. He states:

> Clinical results demonstrate that many patients suffering from a variety of long standing psychosomatic disorders like chronic constipation, bronchial asthma, cardiospasm, and sleep disorders have been cured or have improved considerably in periods varying from two to eight months.
>
> It has been observed that behavior disorders and motor disturbances like stuttering, writer's cramp, nocturnal enuresis, certain states of anxiety and phobia and other neurotic disorders can be treated effectively. Over periods varying from a few weeks

> to several months, depending on the particular case, patients have reported that their anxiety, insecurity and neurotic reactions have smoothed out or have gradually lost their significance. Generally, an increase in emotional and physiologic tolerance, with a considerable decrease in the previous need for reactive affective discharge, is reported. Social contact becomes less inhibited and more natural. Interpersonal relations are reported as warmer and more intimate with certain persons and less emotionally involved with others. (Schultz, 1959, p. 2).

In addition to the above claims, Schultz goes on to cite other benefits: increased bodily resistance to all kinds of stress, greater access to previously unconscious material, ability of the patient to conduct his own therapy, and applicability of the method to eighty to ninety per cent of adults and children above the age of ten.

Now, both Jacobson and Schultz contend that relaxation constitutes the necessary condition for the treatment of emotional disorders. Indeed, when one compares the bases on which psychotherapists of widely different orientations explain their successes, a conclusion that may be reached is that relaxation, whether attained through sutogenic training or as a consequence of recognizing that an acceptant atmosphere prevails in the therapeutic setting, really only sets the stage for the operation of another therapeutically necessary factor. This might conceivably be the acquisition of the cognitive and "emotional" realizations that every new repetition of the threatening stimulus is not a replica of the original cause of the disorder. In Arnold's (1960a) terms the disturbed client needs to be able to appraise percepts for what

they really are: to be afforded a setting in which a previously threatening stimulus is evaluated as non-threatening and, at a secondary level of appraisal, to recognize that unnecessary emotional excitation is unnecessary in the presence of an essentially new threatening stimulus. This freedom from the distortion of reality is implicit in other cognitively-oriented views, (cf. Ellis, 1962; Phillips, 1956; Rogers, 1959).

One might ask: is muscular relaxation either a necessary or sufficient condition of therapeutic success? The proposition has been advanced, in neurological terminology, that the consequences of increased relaxation would appear to be a reduced intensity of bombardment of impulses on the posterior hypothalamus and, via the hypothalamic and reticular systems, a reduced intensity of impulses impinging on the cortex. The summary effect, then, would be to reduce cortical activity to a more nearly optimal level for efficient cognitive functioning. On these grounds, a state of comparative relaxation is a necessary condition for improved functioning when arousal, as in tension states, chronically operates to the detriment of normal behavior. On similar grounds it can be hypothesized that under conditions of chronic lassitude, a mediated increase in arousal could be expected to contribute to more efficient performance. Therapy in such an instance obviously would not require muscular relaxation as much as learning to modulate tension states towards more effective behavior.

PROPRIOCEPTION AND CONNOTATIVE MEANING

The Meaning of Meaning as Understood by Charles Osgood

Osgood (1962) proposes that the individual's meaning system is very closely related to the diffuse discharges from the hypothalamic, reticular, and limbic systems, as well as to cortical functions. Both the meaning system and the non-specific projection systems, he stated: "are gross non-discriminative but highly generalizable systems and both are associated with the affective, purposive, and motivational dynamics of the organism." (Osgood, 1962, p. 21)

Before examining Osgood's statement in detail it is necessary to consider the meaning of meaning. Like emotions, meaning has proved an elusive topic for investigation; while it is generally accepted that an individual behaves according to what a given stimulus situation means or signifies to him, one can only speculate about the manner in which this meaning develops.

The kind of meaning with which theorists of emotion are generally concerned is connotative meaning, that is, the significance assigned by an organism to a given stimulus situation. Since it is also generally believed that a valid description of virtually all behavior must represent each of the affective, cognitive, and motor aspects, then it may be reasoned in the light of earlier discussion that an action, or action tendency, receives at least its emotional colouring from the appraisal of the exciting stimulus.

Osgood (1962) also hypothesizes that connotations lend emotional qualities to meaning and he proposes what he calls a "representational-mediational process", in order to describe the manner in which the connotative meaning assigned to a stimulus input is related to the evaluative reaction to the input referent. In referring to Osgood's theoretical views of meaning, the writer seeks to attain two ends: first, an elucidation of the process whereby the data of sense perception acquire meaning; second, to explore the logic of Osgood's semantic differential since this instrument has been selected by the writer as the most suitable of the available paper-and-pencil devices for testing his hypotheses.

Osgood (1953) states that a person's reaction to a situation cannot be interpreted simply in terms of <u>denoting</u> what the situation 'means', that is, by specifying objects and events in terms of their defining properties. Indeed, to specify objects and events as does, say, a dictionary, suggests greater corsensual agreement among individuals as to any of a population of referents than actually exists. There is another kind of meaning, designated as <u>connotative</u>, which accompanies the denotative meanings of many things. Connotations lend emotional qualities to meaning in such a way as to elicit evaluative reactions to their referents. (Note similarity to Arnold's notion of appraisal). Moreover, the kinds of possible emotional reactions to words varies from individual to individual with the result that, dictionaries

notwithstanding, meanings of objects and events often are not fully shared at all (although Osgood et. al, (1957) have shown that fairly homogeneous groups of individuals tend to share rather similar connotations of more familiar words).

It is to the connotative meaning of meaning that this study is directed, that is, the relation of signs (sense data) to their significates (referents). Linguistic meaning, on the other hand, refers to the relation of language units to their function or position in the code system as a whole, that is, refers to the relation of a sign to one or more other signs. Connotative meaning has also been called psychological meaning on the grounds that it refers to what happens between the reception of a stimulus and the decoding (interpretation) of that stimulus. This is to emphasize that for any given person the decoding process tends to invoke relevant past experience with the stimulus situation, and that it is totally unlikely that the resulting sign would duplicate the pattern of stimulation represented by the significate.

Osgood (1953, 1957) devotes considerable study to the manner in which something which is not a significate can evoke the idea or thought of that significate; how, for example, the sign 'cancer' can come to elicit one or more of the same behaviors which relate to the significate 'cancer'. It is out of theorizings developed by himself with the assistance of Tolman and Hull that he has formulated this definition of the sign-process:

> Any pattern of stimulation which is not the significate becomes a sign of the significate if it produces in the organism a "disposition" to make any of the responses previously elicited by the significate. (Osgood, 1957, p. 5).

Recognizing that certain stimulus-response connections (unconditioned reflexes) are innate or 'wired-in', and that some connections are learned (conditioned reflexes), Osgood (1957, p. 6) defines a <u>significate</u> as "any stimulus which, in a given situation, regularly and reliably produces a predictable pattern of behavior." He then advanced a theory based on two-stage conditioning to describe how this process occurs and within this theory attempted to overcome the failure of the single stage conditioning process to account for the lack of identity between signs and their referents. Figure 2 provides a symbolic account of the development of sign processes.

$S \longrightarrow R_T$ (Fear, morbid curiosity, disgust, thoughts thoughts of smoking, worry, and so on)

(The real disease, "cancer")

$S \longrightarrow r_m \cdots\cdots\cdots s_m \longrightarrow R_X$ (thoughts of smoking, visit to the doctor for check-up)

(The printed word "cancer")

FIGURE 2

Symbolic account of the genesis of a sign process (After Osgood, 1953.

This illustration shows how the pairing of a significate S and a sign $\boxed{S}$ will bestow upon the latter through a representational-mediational process the capacity to elicit

some portion R_x of the total behavior (R_T) typically elicited by the significate.

It will be apparent that this sign process is stimulus-producing in that the effect of sensory signals resulting from stimulus-bombardment will be to elicit representational mediators (r_m's) to produce meaning (s_m's). The meaning that is assigned in the r_m ....s_m process involves, first, a decoding stage in the two-stage operation. However, the process is not as simple as this description might suggest. Attention is directed to Figure 3, in which the left side of the figure depicts the encoding stage (in what may be called the summary account of Osgood's two-stage model). Reading up from the left side, bottom, the decoding operation reveals that the environmental input signs S_a and S_b generate the sensory signals s_a and s_b at the cortical projection level;

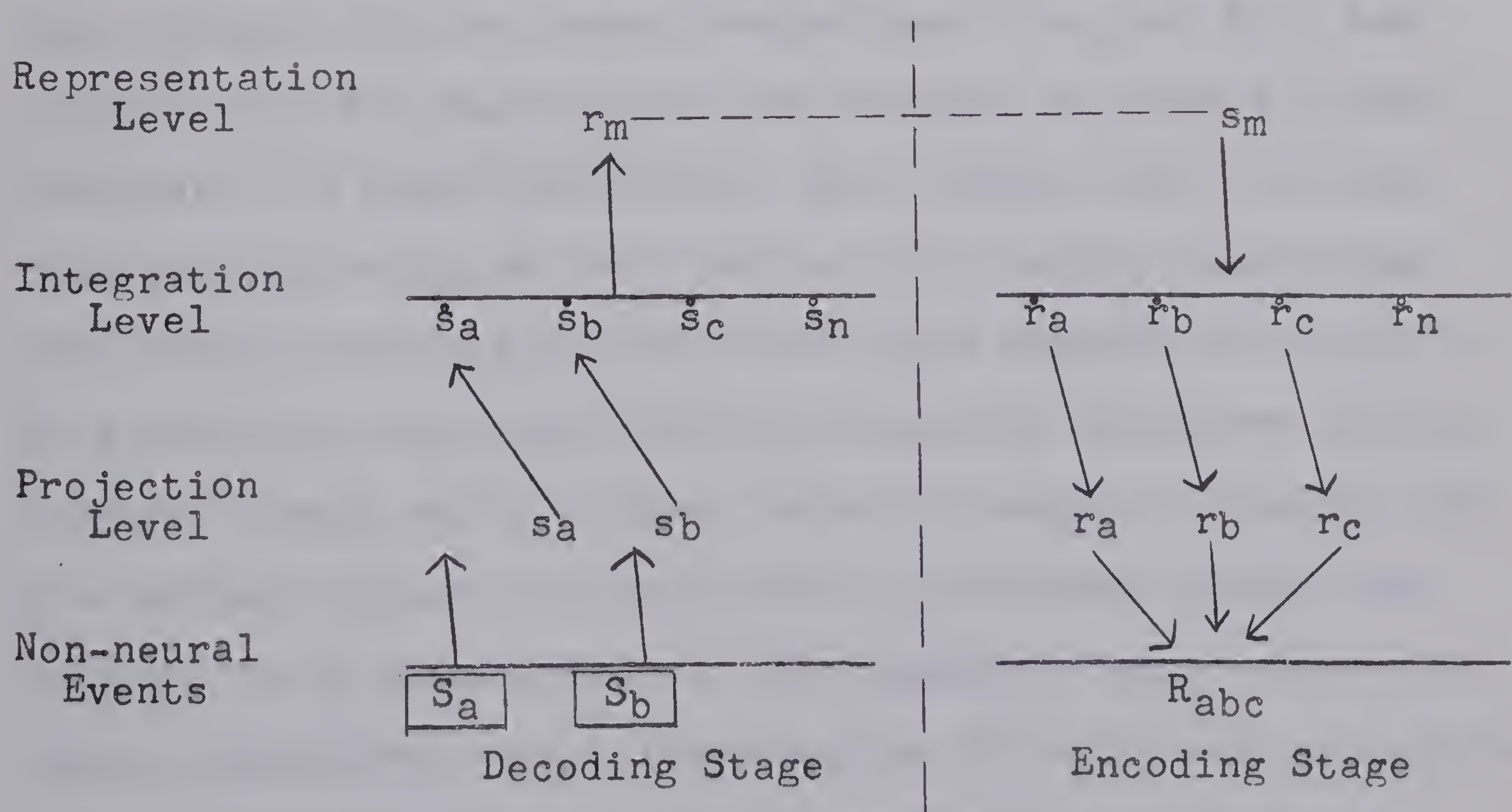


FIGURE 3

Generalized Behavior Model (Osgood, 1957, p. 358)

these in turn give rise at an association level to central neural correlates $\dot{s}_a$ and $\dot{s}_b$ which, on the basis of past experience, may be integrated with the central neural correlates of other input signals ($\dot{s}_c$ ....$\dot{s}_n$). The effect of such integration is to elicit representation-mediators (r_m's) to provide meaning to the input data.

The total process 'unwinds' during the second or encoding stage. The self-stimulations (s_m's) resulting from the representational (r_m) activity, combine in the selection of previously learned motor integrations $\mathring{r}_a$, $\mathring{r}_b$, and $\mathring{r}_c$, which are central neural correlates of the motor projection level signals, r_a, r_b, and r_c. The activation of these signals in turn results in the behavior pattern Rabc (Osgood, 1957).

To return now to the example given on page 44, it will be apparent that the printed word "cancer" is related to the real disease via the common properties of r_m and R_T. How closely sign and significate are related, as judged by the response of a given individual, will depend upon the total behavior occurring at the time the sign became established. One person's meaning of cancer may have emerged as a result of association with many clearly perceived exemplars of the disease itself, while another person's meaning of cancer may have arisen through a single lurid, uninformed verbal description by an acquaintance. The meaning of many signs will reflect therefore, the idiosyncrasies of individual experience.

Osgood's representational-mediational hypothesis

represents a contribution to the theoretical substrate on which the writer rests his case since it suggests how, at the integration or association level, a combination of inputs contributes to the connotative meaning assigned to an exciting stimulus. The various inputs include, in addition to the sensory signals attributed to the stimulus, neural impulses from various other ongoing organismic activities, for example, postural states, visceral events, and "memory storage" areas. Also, the existing arousal level should influence the meaning assigned to the stimulus through its facilitative or detrimental effects on cortical efficiency.

Presumably the efficiency of cortical functioning would be manifested in the expressional stages of emotional behavior since the role of the cortex is to "process" the input data and to decide what pattern of motor activity is appropriate to the presentation or appraisal.

The Relation of Proprioception to Connotative Meaning

If one accepts Gellhorn's (1964) views, it seems reasonable to suppose that, quite apart from the effects produced by characteristic patterns of muscular tension and posture, proprioceptive impulses continuously bombard the hypothalamus and this bombardment must affect mood and emotion. That there are far-reaching differences among individuals in the degree of muscular tension has been noted by Goldstein (1964). He has observed, for example, that

phlegmatic people reveal a relatively constant level of muscle tension, whereas highly excitable individuals show marked variations in level. However, anxious people are not always tense (Balshan, 1962), but take longer to return to basal tension levels when aroused (Barlow, 1959; Malmo, Shagass, and Davis, 1950).

The ongoing patterns of proprioceptive feedback would thus appear to influence behavior by initiating, via the hypothalamic mediation, a change in arousal level. In addition, if we are to accept the formulations of Osgood, the central neural correlates of this feedback become available for interpretation along with the central neural correlates of other input signals. The combined result of this activity is the "representation" of the stimulus and in this form becomes the subject of appraisal (Arnold's term) by the organism.

Osgood does not provide enlightenment concerning the events, if any, which occur in the interval between the occurrence of the representation, (r_m) and the ensuing self-stimulation or tendency to action (a_m). (See Figure 3, p. 45). The writer proposes that the appraisal process begins at the integration level and overlaps into the interval between representation (r_m) and self-stimulation (s_m) since the logic of the sequence of events, as described, precludes the possibility that appraisal could function at any other point in time. The rationale for this statement is borrowed from Arnold, who, it will be recalled, argues that appraisal

involves the processes of evaluation and comparison of sense impressions from many sense modalities. The summary result of these processes may be called the representation of the stimulus (r_m), and the summary effect of the appraisal is a felt action tendency of self-stimulation (sm), followed by emotional expression.

This discussion has been highly speculative; however, it does serve to illustrate that the views of Arnold, Gellhorn, and Osgood can be included in a single theoretical framework.

Pilot Study Findings

Appendix A contains a summary of a preliminary study by Manson (1965) of the effects of imposed tensional states on connotative meaning. In this study Freshmen Ss were required to rate on twelve semantic differential scales the personality, as perceived, of the sculptured head of an adult male, both under the treatment condition and in the normal condition. Significant shifts in meaning emerged for four of the twelve scales. No overall, significant sex differences appeared.

The results of this pilot study are judged to support Gellhorn's hypothesis at least to the extent of justifying a fuller investigation into the effects of imposed tensional states on the connotative meanings of concepts.

SUMMARY

Gellhorn (1964) originally raised the problem which this writer has selected for investigation. Gellhorn, it is recalled, proposes that variations in both phasic and tonic

states of the skeletal muscles influence emotional responsiveness.

This chapter has presented a number of psychological and neurophysiological supports for Gellhorn's formulation. First, it was considered necessary to review the accounts of the manner in which emotions usually arise, are experienced, and contribute to behavior. The theory of Magda Arnold is selected as the theoretical statement about emotions which, in the writer's opinion, most adequately integrated findings from the many germane, specialist fields of study. She proposes that emotions represent the culmination of a sequence of events which begins with the perception of a stimulus, and proceeds through appraisal, emotional experience, and expression (including observable behavior). In her view, emotions vary along an approach-avoidance continuum and according to the degree of impulsion toward or away from a stimulus.

Second, neurophysiological supports, in the form of both experimental data and theoretical analysis have been advanced in support of Gellhorn's hypothesis. The major premise on which he based his proposition is that hypothalamic balance is regulated according to the total quantity of proprioceptive impulses received per unit of time from the postural and activity states of the skeletal muscles. The effect of altered hypothalamic tuning, in turn, ramifies to alter autonomic discharges, arousal level, and cortical activity. The culmination of this sequence of events is to alter emotional behavior.

Third, both theoretical rationale and the positive results of muscle relaxation therapy have been cited to show that induced relaxation in the skeletal musculature frequently engenders a reduction in emotional disturbance.

Fourth, Osgood's representational-mediational hypothesis has been described in some detail in order to report the rationale upon which he based the construction and use of the semantic differential technique. This rationale hinges on his conceptualization of connotative meaning as the evaluative, emotional significance which an individual bestows upon objects and events. In reasoning from this view of connotative meaning it is proposed that, if altered proprioceptive feedback is instrumental in the elicitation of changes in emotional behavior, detectable changes should be expected in the connotative meanings that individuals assign to perceptions.

Finally, the results of Manson's (1965) inquiry into the effects of induced tensions on connotative meaning have been cited. The evidence from this study was judged to lend additional credibility to Gellhorn's hypothesis.

It is concluded that this review of the literature constitutes an adequate basis upon which to develop a set of testable hypotheses which affirm that consciously induced alteration in tonic and phasic muscle contraction patterms will evoke changes in the connotative meanings that individuals assign to concepts.

CHAPTER 111

DEFINITIONS, POSTULATES, AND HYPOTHESES

Definitions

Proprioception

Proprioception is defined in terms of the total contraction patterms prevailing in the muscles at any given time and is viewed as a manifest correlate of the arousal level, including emotional expression, prevailing at the given time.

Emotion

Emotion is defined after Arnold (1960a) as the felt tendency, resulting from the experimental treatment, towards any concept appraised as good or away from any concept appraised as bad. This tendency will be manifest as the directional difference in scores between non-treatment and treatment ratings on a set of semantic differential scales.

Connotative meaning

For the purpose of this study connotative meaning is defined as the numbered interval checked on any of a set of semantic differential scales during an experimental session.

Postulates

1. It is possible for human beings consciously to induce changes of both tonic and phasic character in their prevailing muscular tension states.

2. Among the changes which can be induced are tension states characteristic of emotional expression.

3. Whatever changes are induced in the patterns of

muscle contractions will be reflected in scores on the semantic differential.

Hypotheses

The author's contention, it will be recalled, is that consciously induced alterations in tonic and phasic muscle contraction patterns will evoke changes in the connotative meanings that individuals assign to concepts.

In more specific terms, the possibility is envisaged that quite different treatment conditions might be devised involving, for example, induced facial muscle activity; each of induced overall postural attitudes of rage, pleasure and terror--and an additional treatment condition characteristic of anxiety which involves induced tension in the dorsal neck muscles. It is further envisaged that groups of subjects undergoing such treatments as the above be required to rate various concepts on a set of semantic differential scales before and during treatment. Various hypotheses could then be made concerning the predicted effects of treatments in ratings. A set of these hypotheses has been proposed which in the author's view, are logical outcomes of his review of the literature. They are as follows: first, the conclusions of Gellhorn, Jacobson, and Schultz permit one to predict that treatments consisting of consciously heightened skeletal muscle activity (the conditions of facial muscle activity, each of the simulated fear, pleasure and rage states, and the stiff neck condition) will result, when compared to effects of

a control treatment, in a greater magnitude of change in the connotative meanings of concepts. Second, the findings of Balshan and Goldstein have borne witness to intraindividual differences among basal tension levels, even when at rest. Therefore, it is proposed in this second set of hypotheses, that the effects of heightened muscle activity should be to produce increased among-group variability of changes in the connotative meanings assigned concepts especially for those treatments involving a greater extent of the musculature. Third, the review of the literature has given rise to three sets of hypotheses which bear on the predicted effects of experimental treatments in the directionality of the changed ratings of concepts. Generally, it may be suggested here that, for a given treatment condition, a given concept may be rated according to each of the evaluative, potency, and activity dimensions of meaning.

The rationale for directionality effects is supplied by Arnold who, it is recalled, describes emotions in approach-avoidance terms. This is taken by this author to imply that the muscle tension states usually identified with given, known emotions will, in the event of emotions such as pleasure and rage be associated with approach behavior while, in the event of emotion such as terror and the stiff neck condition often linked with anxiety, be associated with avoidance reactions. A treatment condition like that of facial muscle activity is more difficult to explain under this rationale;

it seems to provide at first thought no basis for directional predictions.

However, another of Arnold's propositions may be recruited here. This refers to her secondary appraisal concept and, according to its supposed function, subjects might be expected to react directionally, not only according to the idiosyncratic effects of the treatments. This is to suggest that both concepts and treatments may be appraised as beneficial, or both may be appraised as aversive, or one may be appraised as beneficial and the other as aversive. Therefore, the appraisal assigned as given concept under a given treatment may be augmented, or confounded, by the effect of treatment upon a given subject. Here, then we have uncovered another variance factor.

One further concern should be noted here; this refers to the different facets of the connotative meaning of concepts according to Osgood's evaluative, potency, and activity dimensions. Briefly, the respective "meanings of these meanings" are: first, the evaluative factor is concerned with the "goodness" or "badness" of things and to a greater degree than the other factors may be equated with Arnold's use of the terms "<u>beneficial</u>" and "<u>aversive</u>"; second, potency refers to power and other like terms; and third, activity connotes quickness, excitement, and the like.

The third set of hypotheses are as follows: under the induced tension states associated with stiff neck and

terror, the evaluative ratings of concepts should manifest negative directionality. On the other hand, under the induced tension states associated with pleasure and rage, these ratings should manifest positive directionality, although the effects of the rage-like condition may be characterized by confounding appraisal tendencies. (i.e. while rage impels one to act positively, the effects on the experiencing subject of this condition may be negative.) Finally, effects of the facial activity treatment are not as easily predicted since composed phasic muscle patterns lack any apparent emotion-relatedness. Notwithstanding this, the author predicts here that treatment ratings will reflect a negative swing because the treatment itself will most likely, be construed as aversive.

The fourth set of hypotheses deal with the predicted directionality of treatment ratings along the potency scales. It is hypothesized accordingly that subjects under the stiff neck and terror treatments will be more likely than before to attribute potency to concepts and, therefore, treatment ratings should manifest positive directionality. On the other hand, the subjects under the simulated pleasure and rage treatments should be less inclined to attribute potency to concepts and their ratings should therefore reflect negative directionality. Again, because of the lack of emotion-relatedness in the tension patterns involved in the facial activity treatment, the effects on ratings are expected to be confounded by varying

secondary appraisal effects and no change in directionality is hypothesized.

The fifth set of hypotheses provides predictive statements concerning the effects of treatments or ratings for the activity scales. Here, it is hypothesized that under all experimental treatments, save the simulated pleasure treatment, subjects will be more disposed to attribute activity to concepts (positive directionality) and the simulated pleasure group will less disposed to do so. (negative directionality).

In summary, it will be apparent that certain treatments should be expected to produce more changes in rating behavior than others. Generally, it should be those treatments in which higher level and more widespread muscle contraction patterms are induced and maintained, that is, the simulated rage and terror treatments. Also, because the tensional characteristics of the pleasure treatment should most resemble the normal state, rating differences here should not be as dramatic. On the other hand, because pleasure involves comparatively relaxed muscles and the other four treatments employ varying levels of tension, the qualitative differences in reactivity should be marked.

The above hypotheses are presented as the following testable propositions. It is noted that the confidence criterion is the .05 level on a one-tailed distribution (unless otherwise noted).

Facial activity effects

The predicted effects of consciously imposed phasic, facial muscle activity on the rating of given concept, in comparison with the non-treatment rating by a control group, are hypothesized as follows:

H 1,1 ... a greater magnitude of shift in ratings

H 1,2 ... a greater within-group variability in the ratings

H 1,3 ... a greater negative rating tendency on evaluative dimension

H 1,4 ... no difference in potency ratings

H 1,5 ... a greater positive rating tendency on activity dimension

Stiff Neck Treatment Effects

The predicted effects of a consciously imposed pattern of tonic, skeletal contractions in the posterior neck and deltoid muscles on the rating of given concepts, in comparison with the non-treatment rating by a control group, are hypothesized as follows:

H 2,1 ... a greater magnitude of shift in ratings

H 2,2 ... a greater within-group variability in the ratings

H 2,3 ... a greater negative rating tendency on evaluative dimension

H 2,4 ... a greater positive rating tendency on potency dimension

H 2,5 ... a greater positive rating tendency on activity dimension

Simulated Pleasure Effects

The predicted effects of a consciously imposed, overall, tonic pattern of skeletal muscle contractions on the rating of given concepts, in comparison with the non-treatment rating by a control group, are hypothesized as follows:

H 3,1 ... a greater magnitude of shift in rating

H 3,2 ... a greater within-group variability in ratings

H 3,3 ... a greater positive rating tendency on evaluative dimension

H 3,4 ... a greater negative rating tendency on potency dimension

H 3,5 ... a greater negative rating tendency on activity dimension

Simulated Rage effects

The predicted effects of a consciously imposed, overall, tonic pattern of skeletal muscle contractions on the rating of given concepts, in comparison with the non-treatment rating by a control group, are hypothesized as follows:

H 4,1 ... a greater magnitude of shift ratings

H 4,2 ... a greater within-group variability in ratings

H 4,3 ... a greater negative rating tendency on evaluative dimension

H 4,4 ... a greater negative rating tendency on potency dimension

H 4,5 ... a greater positive rating tendency on activity dimension

Simulated Terror effects

The predicted effects of a consciously imposed, overall, tonic pattern of skeletal muscle contractions on the rating of given concepts, in comparison with the non-treatment rating by a control group, are hypothesized as follows:

H 5,1 ... a greater magnitude of shift in ratings

H 5,2 ... a greater within-group variability in ratings

H 5,3 ... a greater negative rating tendency on evaluative dimension

H 5,4 ... a greater positive rating tendency on potency dimension

H 5,5 ... a greater positive rating tendency on activity dimension

Comparison of Between-Treatment Effects

Some treatments were more intense and involved a greater portion of the total musculature. Accordingly, the following prediction is advanced:

H 6 ... As a result of treatments, the magnitude of rating shifts by the SR and ST groups will exceed the amount of shift by the FA, SN, and SP groups.

CHAPTER IV

EXPERIMENTAL DESIGN

DESCRIPTION OF THE SAMPLE

The sample selected for the study contained two hundred and twenty-seven females and one hundred and eleven males, all of whom were volunteer freshmen students enrolled in an introductory course in educational psychology. The recruitment procedures were standardized as follows:

1. Certain conditions were specified concerning participation in the study: first, that Ss had not reached their twenty-second birthday; second, that Ss would maintain strict confidence concerning the details of the experimental tasks; third, that Ss would honour their obligation to participate once they had made a commitment.

2. Contract forms were completed by volunteers in order to make their commitment to participate more binding and also to obtain from the intending Ss those times of the day and week when they could most conveniently present themselves as Ss.

3. The total expected commitment in time was stated as one session not exceeding one hour and thirty minutes.

Randomization procedures were employed to assign identical proportions of males and females to one control

group, five experimental groups, and to a "reserve corps." The function of the last group was to provide replacements for drop-outs.

TREATMENT

In all, sixty treatment sessions were conducted with groups ranging in size from two to six. In order to distribute this time span equitably across groups and to control the leakage of information bearing on experimental procedures, the control and experimental treatments were randomized. This is to say, the scheduling of all treatments within the period of data collection was determined according to chance.

The experimental procedures adhered to the following general format:

1. All Ss were required to rate the following concepts on each of the twelve scales* of a semantic differential:

abstract art
dreaming
virility
aviqusx (a nonsense word)
myself

*The twelve semantic differential scales employed in the study are presented in Appendix B.

2. The second task assigned was to solve the problem known as Archimedes' Spiral Puzzle (see Appendix C). The purpose of this activity was to occupy fifteen minutes of time between the first administration and a second administration of the rating scales and thereby to counteract successful reminiscence. In order to minimize arousal, the puzzle was treated with levity by E, cues were freely dispensed and, in keeping with the promise made during the introduction of the task, no results were recorded.

3. The Ss were required to rate the concepts again. As a further safeguard against successful reminiscence, the semantic differential scales were reordered.

4. The Ss in the experimental groups were required to rate concepts under a treatment condition. Again, in order to correct for position effect, one-half of each experimental group carried out the first set of ratings under the treatment condition and the remaining half of each group undertook the second set of ratings under treatment.

All experimental Ss received training and practice for a period of time appropriate to the mastery of the required treatment conditions.

5. The nature of the experimental conditions required that Ss be concealed from one another's view and yet remain clearly visible to E in order that he might

determine to what extent instructions were being followed.

This physical requirement was met through constructing, out of 4' by 8' sheets of plywood, two back-to-back rows of three cubicles each. Ss were seated in chairs facing outwards and, while they could be observed from the Experimenter's vantage point, they were unable to watch one another. The physical arrangements, as described, are illustrated in Figure 4.

6. The procedures followed in the administration of the five different experimental treatments were also similar in their general form:

(a) Ss were given a carefully detailed verbal description of the treatment condition, followed by a demonstration of the condition by E.

(b) A period of supervised practice followed in which three or more periods of twenty seconds each were provided, commencing with the word "Begin" and ending with "Stop." During this time E moved from S to S giving direction and encouragement as needed.

(c) When Ss had demonstrated that they could comply with treatment directions, they were then required on the word "Begin" to adopt the specified treatment posture and immediately after to "concentrate" on their pencils. Following this, Ss repeated the procedure, this time concentrating on the word "Instructions" on Page 1

FIGURE 4

The Experimental Setting

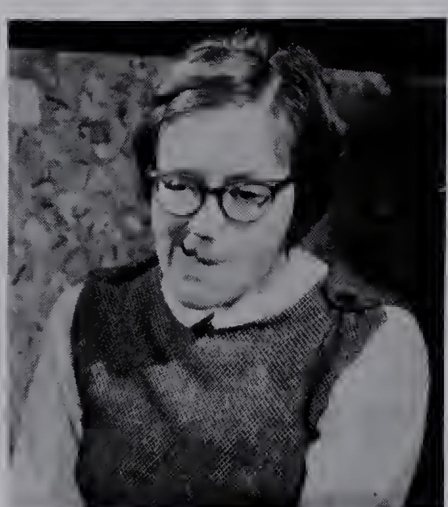


FIGURE 5

The Facial

Activity Treatment

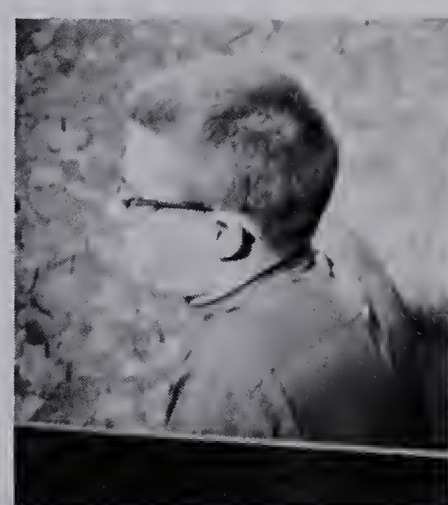


FIGURE 6

The Stiff Neck

Treatment

of the test booklet. When Ss individually gave assurance that they could induce and maintain the required posture or facial activity and attend simultaneously to another task, the business of rating concepts began.

(d) Close supervision of Ss was carried out during ratings.

(e) Concepts were rated one at a time and the instruction to proceed to another page was given one minute after the last S in a group had completed the rating of the previous concept.

The descriptions of the experimental treatments administered to the respective groups are as follows:

(a) One experimental group, hereafter designated as the Facial Activity or FA group, was directed to initiate a pattern of changing movements in the muscles of the face, that is, brow, nose, cheeks, mouth, jaws. (See Figure 5). It was further required of Ss that these movements attain nearly maximum amplitude (that is, just short of discomfort) and that the movements not taper off during the rating of concepts.

(b) Another experimental group, known hereafter as the Stiff Neck or SN group, was directed to sustain the head in an antigravity, upright position. (See Figure 6). This posture induces tension in the

muscles located at the posterior base of the neck in and adjoining the shoulder muscles.

(c) The third treatment to be described was administered to what shall be called the Simulated Pleasure or SP group. The requirements of this treatment were that Ss relax their skeletal muscles as fully as possible, notwithstanding the fact that they were seated on hard chairs, and then form an upturned crescent with the mouth and relax, but not close the eyelids. (See Figure 7).

A fully relaxed state can be achieved usually only with practice, indeed more practice than it was possible to provide in one experimental session. The instructions employed here did, however, comply with the method of Jacobson (1938). Accordingly, Ss were encouraged, sequentially, to focus their thoughts on given muscle groups and progressively to relax these muscle groups, that is, Ss were instructed to concentrate on the relaxation of a foot, a calf, upper leg, and then to apply the same procedure to the other leg, and so on.

This technique was rehearsed until Ss grasped the essentials of the method and could initiate the state of relaxation preparatory to the rating of each concept.

(d) A fourth group, hereafter known as the Simulated Rage or SR group, received instruction in the

initiation and maintenance of the tonic facial and postural muscle patterns which conventionally typify rage. The specific elements of the posture included: the firming and retracting of the lips against the teeth, a distinct frown, tightening of the jaws, and clenching of teeth and fists. Ss were also required to sit in an "alert" position, to induce a state of moderate tension (as opposed to rigidity) in the skeletal muscles, and to rest the weight of the legs on the balls of the feet. (See figure 8).

(e) The final treatment to be employed was administered to what shall be called hereafter, the Simulated Terror or ST group. Ss in this group were required to tense rigidly the muscles of limbs and trunk and to open widely both eyes and mouth, as illustrated in Figure 9.

On the completion of their rating assignments, Ss were directed to provide a brief, written, subjective account of the dominant sensations, if any, which occurred in association with the treatment condition and which were not noticeably apparent during the non-treatment rating. The instruction was no more structured than this, in order to counteract the possibly suggestive effects induced by the content of specific questions, for example, did you feel happy, angry, afraid, and so on.

FIGURE 7

Simulated Pleasure

Treatment

FIGURE 8

Simulated Rage

Treatment

FIGURE 9

Simulated Terror

Treatment

DESCRIPTION OF THE MEASURING INSTRUMENT

Osgood, Suci, and Tannenbaum (1957) have designed a psychometric method called the semantic differential with which they endeavoured to measure indirectly the connotations of words or objects. The rationale of the method is rooted in the conceptualization of a "semantic space, a region of some unknown dimensionality and Euclidian in character" (Osgood, et al. 1957, p. 25). The termini of the various possible semantic dimensions are defined by pairs of polar adjectives arranged along seven-point scales. These scales possess straight line functions that pass through the origin of the semantic space at the loci of the scale mid-points.

Through factor analysis Osgood, et al, has identified three orthogonal dimensions referred to as evaluative or attitudinal, potent and active. In the modification of the method used in this study the first four scales are roughly directional along the evaluative axis; the next four along the potency axis; and the last four along the activity axis.

Osgood, et al, employed factor analysis in the determination of the major dimensions of semantic space and the results of their several studies reveal that the same primary factors appeared. For example, in one

study of semantic differential ratings by two hundred university students, the three factors accounted for approximately 48 per cent of the variance. The first of these factors accounted for 33.8 per cent of the total variance and was evaluative in nature. The second and third factors accounting for 7.6 per cent and 6.2 per cent of the variance, were identified as, respectively, the potency and activity factors (Osgood, et al, 1957, pp. 33 - 39).

The three factors have appeared as the dominant factors; however, Osgood, et al view semantic space as multi-dimensional in character. This is to say that they believed that more factors than the three identified above, are involved in meaningful judgments about things. Other factors have indeed been identified also but each contributes little to the total variance.

On rating an object or concept along any given scale, a subject can therefore be said to fix his connotative meaning of the object or concept in semantic space. Through assigning the object or concept a point on a scale he established both a direction from the origin, identified with the quality of the meaning and a distance from the origin, identified with the intensity of the meaning. It can be seen then, that the direction from the origin of the meaning assigned depends on the alternative polar

adjectives selected, and that the distance depends on the extremeness of the scale positions checked.

Osgood, _et al_, equate the location of a concept in semantic space with the evocation by the concept of a set of mediating reactions, the direction variable being equated to what mediators are evoked and the distance variable being equated to the intensity (habit strength) of the evocation. Each scale position checked is, moreover, thought to be associated with a complex mediating process, the dominant component of which is contingent upon the given polar terms while the intensity component is dependent on the qualifiers represented by positions along the scale. These different mediators are related during the encoding operation to the various scale positions selected. According to the generalization principle, Osgood, _et al_, contend that

> the concept will elicit checking of that scale position whose dominant mediator component most closely matches in intensity the corresponding component in the process associated with the concept itself. (Osgood, _et al_, 1957, p. 30)

This is to suggest then that the selected scale positions as co-ordinates of the concept in semantic space correspond to the co-ordinates in the measurement space, and consequently are functionally equivalent to the components of the representational mediational process relating to the concept.

Reliability

Osgood, et al, assert that the usual methods of computing reliability coefficients do not succeed with semantic differential data because scores are "too consistent, resulting in variances of almost negligible magnitude." (1957, p. 127). As a measure of score stability from test to retest, they employed a score reproducibility criterion as a means of matching score deviations of a given size against the probability of obtaining deviations of that size. In support of this method of estimating the reliability of the semantic differential, Osgood, et al, cite their first factor analytic study. Using one hundred subjects and a forty-item test they observed that "the mean of the observed average deviation for items is .67 scale units whereas the mean of the expected average deviations for items is 1.20 scale units." (1957, pp. 129-130). Norman (1959) has conducted a test of stability involving thirty subjects, twenty concepts, twenty scales and a test-retest period of four weeks, and found that the mean score deviation was 1.07 units. No sex differences were apparent and forty per cent of the scores remained the same and thirty-five per cent shifted one unit. His analysis of group-mean ratings also reveal high stability over time, and during which no systematic treatment is administered.

Validity

Concurrent validation of the semantic differential technique is lacking since, as Osgood, et al (1957) point out, there is no comparable criterion scale for measuring connotative meanings. However, a number of investigations have been conducted by Osgood and his associates which attest to high construct validity for the scales (Osgood, 1952, 1959, 1962; Osgood, Suci, and Tannenbaum, 1957; Osgood, Ware, and Morris, 1961; Suci, 1962). Perhaps the most pertinent of the recent studies is Osgood's, (1962) "progress report" of his ongoing investigations into the generality of meaning systems. Osgood has revealed in the eight countries, both Indo-European and non-Indo-European, studied to date, that affective meaning systems can be generalized to people who differ widely in both language and culture. Factor analyses of the most frequently used qualifiers and their opposites for the languages represented have presented clear evidence for shared evaluation and potency factors, and definite but less clear results have favoured the sharing of an activity factor.

Osgood, et al (1957) also base their use of the semantic differential on certain scaling assumptions. First, the property of equal intervals within scales is assumed. Second, they assume that the zero point in each

scale falls at its centroid. A method involving a least squares solution (Osgood, _et al_, 1957) was employed to test these assumptions and it was revealed that an interval-like quality existed within scales and also that interval sizes were fairly consistent between scales. Furthermore, the origin was discovered to fall on approximately the same locus on all scales, the zero point being located so that the centre category is always slightly negative. In consequence of these findings Osgood, _et al_, conclude that the scaling properties of the semantic differential have some basis other than assumption.

A study by Messick (1957) reveals that the between scale intervals were quite similar and the distortion within the scales was not large enough to justify rejection of the equal interval assumption. Mehling's (1959) study lends support to other assumptions that semantic measures do measure direction and intensity of attitude and that the centre interval on the scale represents the neutral point.

Sensitivity

Osgood, _et al_, (1957) contend that the ability of the semantic differential to distinguish between meanings is in close correspondence with distinctions made independently by language users.

STATISTICAL TREATMENT OF DATA

For the purpose of this investigation the signed differences between the first and second ratings for each concept in the twelve scales of the instrument were computed for each subject and the resulting deviation values were treated as scores.

Comparison of Between-Groups Means

A one way analysis of variance was applied across groups to scores for each scale. In order that the magnitude of any possible change may contribute maximally to the various treatment means, absolute or unsigned scores were entered into the computations. The confidence level of differences in means was tested with the Newman-Keuls method, adopting as the minimum level of significance the .05 level (one-tailed test).

Generally, non-parametric procedures are to be recommended for data of the sort collected in this study; however, since the scaling assumptions of equal intervals and zero points were accepted by the writer, the use of parametric procedures was judged appropriate.

Comparison of Variances Between Groups

The one-way analysis of variance procedure was used to determine the variances among scores for all groups, this

time using signed scores in order to retain the true picture concerning score variability and directional shifts in rating. In order to test for homogenity of variance the F-test was applied and the .05 level of confidence (two-tailed test) was adopted.

Comparison of Directional Shifts in Ratings Among Groups

Variability among scores obviously is not to be confused with variability in the direction in which the scores fall. Consequently, plus, zero, and minus scores were counted for each scale across all groups, and converted to per cents of each group N. The difference in per cents between plus, zero, and minus scores were tested for significance by means of the one-tailed t-test at the .05 level of significance.

Tabulation of Introspective Reports

The written reactions of subjects to treatments were assigned random numbers and then categorized by an independent, impartial observer. For the purpose of more convenient comparison the frequencies of reactions were entered as per cents of the respective group N's.

CHAPTER V

ANALYSIS OF RESULTS

ANALYSIS OF VARIANCE FINDINGS

Comparison of Mean Shifts in Ratings

As a preliminary to the analysis of specific treatment effects on mean difference scores, several items of importance should be mentioned.

First, the analysis of variance and results of the comparisons of mean scores, presented in Table 11, report both the mean scores (rating shifts) across concepts for each scale and, through combining these results across each set of four scales, the totals for each dimension.

Second, an inspection of treatment means across scales (see Appendix D) will reveal that the experimental treatment means exceeded the control treatment means in 93 per cent of all comparisons. Admittedly, only a minority of the differences were significant; however, this pattern of uniformity is noteworthy. Inspection of Appendix G will also reveal that the effects of combining results across scales have contributed to regression. Hence, the "Totals" noted in Appendix G represent attenuated findings. For this reason frequent reference will be made in the following discussion to Tables 11 through V111, showing the differences between mean scores for experimental and

control groups.

For purposes of convenience the comparisons between means will be summarized and analyzed under treatment headings.

Facial Activity Effects

H 1,1 predicted that the FA mean rating shift would be greater than the control mean rating shift. Table 11 reveals that the FA mean was greater in two instances in twenty for the Evaluative Dimension and in one instance in twenty for each of the Potency and Activity Dimensions. The particular scales for which these differences were demonstrated are: True-False (Abstract Art), Wise-Foolish (Virility), Strong-Weak (Myself), and Hot-Cold (Myself).

The magnitude of the differences between FA and control means is shown in Table 11, and while the FA mean was greater in fifty-six of the sixty comparisons, the fact that only four differences were statistically significant provides insufficient evidence in support of H 1,1.

Stiff Neck Effects

H 2,1 predicted that SN mean rating shifts would exceed those for control Ss. The scale-by-scale comparison of SN and control means, provided in Table 111, reveals that the SN mean is greater than the control mean in one instance for each of the three dimensions. The scales for

TABLE 11

DIFFERENCES BETWEEN MEAN RATING SHIFTS
FOR FA AND CONTROL GROUPS

Dimension	Scale \ Concept	Abstract Art	Dream-ing	Virility	Aviqusx	Myself
Evaluative	True-False	.37*	.05	.15	.35	.32
	Clean-Dirty	.37	-.07	.23	.42	.13
	Kind-Cruel	.28	.34	.23	.61	.16
	Wise-Foolish	-.07	.11	.44**	.45	.30
Potency	Strong-Weak	.22	.23	.19	.15	.44**
	Int-Boring	.26	.07	.26	.18	.07
	Severe-Lenient	.33	.27	-.11	-.14	.24
	Deep-Shallow	.47	.42	.18	.14	.15
Activity	Active-Passive	.02	.85	.08	.64	.59
	Hot-Cold	.33	.32	.15	.25	.57*
	Fast-Slow	.43	.28	.37	.10	.24
	Tense-Relaxed	.30	.09	.04	.27	.27

*In Tables 11 through X11, * refers to the -05 level;

** refers to the -025 level.

which this finding is reported, are: True-False (Myself), Strong-Weak (Virility), and Tense-Relaxed (Myself).

Attention is drawn to the highly significant difference finding for Tense-Relaxed (Myself). The possibility is noted that awareness by Ss of the tension associated with the stiff neck condition, may have augmented the hypothesized treatment effects.

Again, while the SN means are generally greater than control means (fifty-two of the sixty comparisons), the evidence favouring H 2,1 must be judged insufficient since only four differences attained statistical significance.

Simulated Pleasure Effects

Table lV reveals that in only two comparisons did an SP mean exceed a control mean. In both instances the larger means occurred in the rating of Myself, on the Active-Passive and Tense-Relaxed scales. The differences between SP and control means, generally speaking, are small and suggest that the tensional characteristics of SP and Control SS were more alike than predicted.

The evidence does not support the prediction (H 3,1) that SP means would be greater.

TABLE 111

DIFFERENCES BETWEEN MEAN RATING SHIFTS
FOR SN AND CONTROL GROUPS

Dimension	Scale \ Concept	Abstract Art	Dream-ing	Virility	Aviqusx	Myself
Evaluative	True-False	.34	.17	-.04	.35	.39*
	Clean-Dirty	.08	-.04	-.02	.04	.19
	Kind-Cruel	.23	.22	-.23	.08	.23
	Wise-Foolish	.15	.25	.19	.24	.27
Potency	Strong-Weak	.09	.20	.49*	.19	.19
	Int-Boring	.21	.15	.11	.14	.22
	Severe-Lenient	.06	.16	.36	-.25	.19
	Deep-Shallow	.13	.00	.23	.12	.38
Activity	Active-Passive	.09	-.07	.13	.53	.25
	Hot-Cold	.28	.22	-.05	.39	.12
	Fast-Slow	.30	-.01	.02	-.14	.24
	Tense-Relaxed	.07	.68	.26	.17	.95**

TABLE 1V

DIFFERENCES BETWEEN MEAN RATING SHIFTS
FOR SP AND CONTROL GROUPS

Dimension	Scale \ Concept	Abstract Art	Dream-ing	Virility	Aviqusx	Myself
Evaluative	True-False	.26	.07	.17	.05	.09
	Clean-Dirty	.05	-.12	.00	.34	.08
	Kind-Cruel	.04	.47	-.09	.19	.23
	Wise-Foolish	.13	.21	.04	.19	.10
Potency	Strong-Weak	.12	.33	.22	.15	.04
	Int-Boring	-.11	-.05	-.02	.06	.12
	Severe-Lenient	.26	.07	.12	-.20	.41
	Deep-Shallow	.04	.02	.10	.50	.15
Activity	Active-Passive	-.10	.54	.25	.33	.24**
	Hot-Cold	-.12	.52	.22	.20	.19
	Fast-Slow	.01	-.17	.17	.06	.24
	Tense-Relaxed	.17	.29	-.07	.20	.57*

<u>Simulated</u> <u>Rage</u> <u>Effects</u>

A scale-by-scale comparison of the SR and control means, reported in Table V, reveals the following differences in favour of the <u>SR</u> treatment.

Evaluative dimension: for the five comparisons on the True-False scale, the SR mean was greater in <u>three</u> instances (Abstract Art, Virility, and Myself) and, in a fourth instance, the difference approached significance (Aviqusx). <u>Two</u> other significant differences are noted, <u>one</u> for Wise-Foolish (Virility) and <u>one</u> for Clean-Dirty (Myself). The positive findings for the True-False scale merit attention. Here, the prediction that SR treatment would be accompanied by an increase in evaluative activity is clearly borne out by ratings in this scale.

Potency dimension: <u>greater</u> SR means are reported in the rating of Dreaming for the scales Strong-Weak, Interesting-Boring, and Deep-Shallow. It does seem rather remarkable that the high potency differences should occur for Dreaming since potency is more readily associated with Virility unless, of course, the directional shifts in the rating of Virility are shown to be toward the less potent pole.

Activity dimension: <u>two</u> differences in <u>five</u> are reported for the Tense-Relaxed scale (Dreaming and Myself)

TABLE V

DIFFERENCES BETWEEN MEAN RATING SHIFTS FOR SR AND CONTROL GROUPS

Dimension	Scale \ Concept	Abstract Art	Dream-ing	Virility	Aviqusx	Myself
Evaluative	True-False	.63*	.40	.46*	.49	.47*
	Clean-Dirty	.42	.18	.13	.56	.42*
	Kind-Cruel	.54	.32	.21	--	.21
	Wise-Foolish	.30	.33	.71*	--	.35
Potency	Strong-Weak	.28	.55*	.44	.37	.28
	Int-Boring	.54	.59**	.42	.47	.28
	Severe-Lenient	.26	.56	.35	.10	.16
	Deep-Shallow	-.11	.60*	.47	.30	.25
Activity	Active-Passive	.23	--	.28	--	--
	Hot-Cold	.32	.25	.18	.14	.12
	Fast-Slow	.31	.19	.61*	-.04	.24
	Tense-Relaxed	.32	.77**	.16	.19	.91**

and one for the Fast-Slow scale (Virility).

Again, the rating of concepts on the Tense-Relaxed scale, by Ss who were directed to maintain a tense state, admittedly, may have biased this finding.

In summary 11 SR means in 55 comparisons were greater than control means. Five of these differences emerged on the True-False scale. The evidence lends modest though definite support to the hypothesis that SR means would be greater.

Simulated Terror Effects

The instances for which the ST mean exceeded the control mean, as reported in Table V1, are as follows: Evaluative dimension: two comparisons in five, in the True-False scale, demonstrate differences between ST and control means, and these differences are noted for the ratings of the concepts Abstract Art and Virility. In addition, two differences are noted for the Wise-Foolish scale (Virility and Aviqusx) and one for Kind-Cruel (Aviqusx). It is also reported that four of the five differences are significant at the .025 level.

The similarity to the SR treatment effects is clearly apparent; again the True-False scale appears to have aroused evaluative ratings of the same two concepts, Abstract Art and Virility; and again, the difference reported for Aviqusx approaches significance (see Appendix G). In addition, it is reported (Table V111, page 92) that the ST evaluative

TABLE V1

DIFFERENCES BETWEEN MEAN RATING SHIFTS FOR ST AND CONTROL GROUPS

Dimension	Scale \ Concept	Abstract Art	Dream-ing	Virility	Aviqusx	Myself
Evaluative	True-False	.61**	.25	.54**	.44	.19
	Clean-Dirty	.35	.38	.08	.11	.13
	Kind-Cruel	.35	.47	.33	.85*	.21
	Wise-Foolish	.06	.08	.43*	1.10**	-.08
Potency	Strong-Weak	.36	.67**	.78**	.67*	.41**
	Int-Boring	.29	.16	.29	.54	.07
	Severe-Lenient	.38	.16	.04	.26	.19
	Deep-Shallow	-.01	.70**	.10	.50	.39
Activity	Active-Passive	.30	.53	.25	1.22**	.68
	Hot-Cold	.04	.17	.15	.53	.20
	Fast-Slow	.57	.13	.52	.15	.30
	Tense-Relaxed	.54	.46*	.06	.87**	1.43**

ratings were clearly biased toward the negative pole.

Potency dimension: here, we find that four of the five Strong-Weak, ST means are greater (Abstract Art being the exception), and that three of the four differences are significant beyond the .025 level. In addition, the Deep-Shallow (Dreaming) difference is significant at the .025 level.

Although the directional trends, reported in Table V11, page 91 reveal no significant differences, the scale Strong-Weak clearly stimulated a strong reaction among ST Ss. It may be that Ss reacted at this point, not only to the concepts rated but also to the bipolar terms themselves; that is, the word Strong may have contained, for some Ss, a connotation of threat.

For similar reasons, the terms Deep and Shallow may have generated in greater degree a shift in connotative meaning for the concept Dreaming than they succeeded in doing for the remaining concept.

Activity dimension: in three of the five Tense-Relaxed scales (Dreaming, Aviqusx, and Myself) and one of the five Active-Passive scales (Aviqusx), the ST mean is greater. It is noteworthy that three of the four differences are significant at the .025 level.

Again, the term Tense-Relaxed might have influenced the ratings, especially in the rating of Myself, in which more than half of the Ss reacted in the tense direction

(see Table V111, page 92). No such directional tendency is reported for the ratings of either Dreaming or Aviqusx, suggesting that for less evaluative concepts, treatment effects may have been primarily responsible for the reported differences.

In summary: fourteen of the sixty comparisons across dimensions reveal greater ST means. Of these, ratings on the True-False, Wise-Foolish, Strong-Weak, and Tense-Relaxed scales account for Eleven of the findings. Also, Abstract Art produced only one significant finding, thus the differences occur mainly for four concepts.

Modest though definite support is therefore reported for H 5,1 which specified that ST means would exceed control means.

Comparison of Between Experimental Treatment Means

H 6 predicted that SR and ST mean rating shifts would be significantly greater than FA, SN, and SP mean rating shifts. The results of the comparisons, on the scale-by-scale basis, are as follows:

Evaluative dimension: Table V11 shows that the SR mean significantly exceeded the FA mean once on the scale of True-False (Virility) and both SN and SP means once, occurring in each instance on the scale, Wise-Foolish (Virility).

The ST mean significantly exceeded the SN mean on the three Virility scales, True-False, Kind-Cruel, and Clean-Dirty, (See Table V111).

TABLE V11

SUMMARY OF DIFFERENCES BETWEEN SR MEAN SCORES AND EACH OF FA, SN, AND SP MEAN SCORES[1]

Evaluative Dimension

Concept	Abstr Art			Dreaming			Virility			Aviqusx			Myself		
Scale	FA	SN	SP	FA	SN	SP	FA	SN	SP	FA	SN	SP	FA	SN	SP
Tru-Fal	26	29	37	35	23	33	31	50*	44	14	13	44	15	08	38
Cle-Dir	05	36	37	25	22	30	-10	15	13	14	52	22	29	23	34
Kind-Cru	16	21	04	-02	10	-15	-02	44	30	--	--	--	05	-02	-02
Wise-Fool	37	15	17	22	08	12	27	52*	67**	--	--	--	05	08	25

1. For Tables V11 through X11 differences have been taken to the nearest hundredth and decimals have been omitted.

TABLE V111

SUMMARY OF DIFFERENCES BETWEEN ST MEAN SCORES AND EACH OF FA, SN, AND SP MEAN SCORES

<u>Evaluative</u> <u>Dimension</u>

Concept	Abstr Art			Dreaming			Virility			Aviqusx			Myself		
Scale	FA	SN	SP	FA	SN	SP	FA	SN	SP	FA	SN	SP	FA	SN	SP
Tru-Fal	24	27	35	20	08	18	39	58**	37	09	09	39	-13	-20	10
Cle-Dir	-02	27	30	45	42	50	-15	10	08	-31	07	-23	00	-06	05
Kind-Cru	07	12	-05	13	25	00	10	56*	42	24	77*	66	05	-02	-02
Wise-Fool	13	-09	-07	-03	-17	-13	-01	24	39	65	86	91	-38	-35	-18

Potency dimension: As reported in Table 1X, the SR mean was greater than each of the FA, SN, and SP means on one and the same scale (interesting-Boring, Dreaming).

TABLE 1X

SUMMARY OF DIFFERENCES BETWEEN SR MEAN SCORES AND EACH OF FA, SN, AND SP MEAN SCORES

Potency Dimension

Concept	Abstr Art			Dreaming			Virility			Aviqusx			Myself		
Scale	FA	SN	SP	FA	SN	SP	FA	SN	SP	FA	SN	SP	FA	SN	SP
Str-Weak	06	19	-16	32	35	22	25	-05	22	22	18	22	-16	09	24
Int-Bor	28	33	65	52*	44*	64**	16	31	44	29	33	41	21	06	16
Sev-Len	-07	20	00	29	40	49	46	-01	23	22	35	30	-08	-03	-25
Deep-Shallow	-58	-24	-15	18	60	58	29	24	37	16	18	-20	10	-13	10

The ST mean is reported in Table X to exceed the FA mean once (Strong-Weak, Virility), the SN mean once (Deep-Shallow, Dreaming), and the SP mean twice (Deep-Shallow, Dreaming, and Strong-Weak, Virility).

TABLE X

SUMMARY OF DIFFERENCES BETWEEN ST MEAN SCORES AND EACH OF FA, SN, AND SP MEAN SCORES

Potency Dimension

Concept	Abstr Art			Dreaming			Virility			Aviqusx			Myself		
Scale	FA	SN	SP	FA	SN	SP	FA	SN	SP	FA	SN	SP	FA	SN	SP
Str-Weak	14	27	24	44	47	34	59**	29	46**	52	48	52	-03	22	37
Int-Bor	03	08	40	09	01	21	03	18	31	36	40	48	00	-15	-05
Sev-Len	05	32	12	-11	00	09	15	-32	-08	38	51	46	-05	00	10
Deep-Shallow	-48	-14	-05	28	69**	68**	-08	-13	00	36	38	00	24	01	24

Activity dimension: As reported in Table X1, the SR mean exceeded only the FA mean and this occurred in two instances, once for Tense-Relaxed (Dreaming), and once for Tense-Relaxed (Myself).

TABLE X1

SUMMARY OF DIFFERENCES BETWEEN SR MEAN SCORES AND EACH OF FA, SN, AND SP MEAN SCORES

Activity Dimension															
Concept	Abstr Art			Dreaming			Virility			Aviqusx			Myself		
Scale	FA	SN	SP	FA	SN	SP	FA	SN	SP	FA	SN	SP	FA	SN	SP
Act-Pass	21	14	33	--	--	--	20	15	03	--	--	--	--	--	--
Hot-Cold	-01	04	44	-07	03	-27	03	23	-04	-11	-25	-06	-45	00	-07
Fast-Slow	-12	01	30	-09	20	36	24	59	44	-14	10	-10	02	02	02
Tense-Relaxed	02	25	15	68*	09	48	12	-10	23	-08	02	-01	64*	-04	34

Finally, it is reported in Table X11 that the ST mean was greater than the FA mean in one comparison (Tense-Relaxed, Myself), than the SN mean twice in the ratings of Aviqusx (on the Active-Passive and Tense-Relaxed scales) and than the SP mean once, on the rating of Myself (on the Tense-Relaxed scale).

TABLE X11

SUMMARY OF DIFFERENCES BETWEEN ST MEAN SCORES AND EACH OF FA, SN, AND SP MEAN SCORES

tivity Dimension

ncept	Abstr Art			Dreaming			Virility			Aviqusx			Myself		
ale	FA	SN	SP	FA	SN	SP	FA	SN	SP	FA	SN	SP	FA	SN	SP
t-Pass	28	21	40	-32	60	-01	17	12	00	58	69*	89	09	43	-56
t-Cold	-29	-24	16	-15	-05	-35	00	20	-07	28	14	33	37	08	01
st-Slow	14	27	56	-15	14	30	15	50	35	05	29	09	06	06	06
nse-elaxed	24	47	37	37	-22	17	02	-20	13	60	70*	67	1.16**	48	86*

In summary: the number of significant differences does not warrant conclusive support for the hypothesis that FA and ST mean rating shifts would exceed significantly FA, SN, and SP mean rating shifts.

According to the theoretical formulations on which this study is based, muscle contraction states which are more intense and which involve a greater portion of the body musculature should produce manifestly greater shifts of meaning in the ratings of concepts. Hence, the SR and ST treatments should result in changes in the connotative meanings of concepts which exceed similar changes induced by FA, SN, or SP treatments, since both FA and SN treatments consisted of the contraction of facial and neck muscles while the SP treatment consisted of relaxing the body muscles.

In reference to the earlier discussion about the comparisons between <u>experimental treatment</u> and <u>control treatment</u> rating shifts, a sufficient number of differences were reported for the more intense SR and ST tension states to warrant support for the hypotheses predicting those results. Likewise, the within-group variance among rating shifts (see Table X111) permits one to order treatment results according to varied effects on Ss, and that is, variability treatment effects were more pronounced for SR and ST groups and, in order of diminishing magnitude, were less pronounced for FA, SN, and SP groups.

The rather meagre evidence that was reported in favour of greater mean rating shifts for SR and ST groups does not seriously upset this ordering pattern, since it is noted that

the frequencies for which either a SR or ST mean significantly exceeded a FA, SN, or SP mean were, respectively five, nine, and five.[1]

COMPARISONS BETWEEN WITHIN-GROUP VARIANCES

The comparison of within-group variance yielded findings of a generally positive character. In arriving at these finding (reported in Appendix F), fifteen between-pairs comparisons of within-group variances were made across each of the sixty scales. This extensive accumulation of findings has been summarized in Table 111 to show the differences between the percentage of cases in which the variance finding for any one group is significantly greater than that of another. Hence we find the difference in per cents between the instances in which the FA group variance exceeds Control group variance <u>and</u> the instances in which the Control group variance exceeds FA group variance, amount to 46.6. This difference in per cents is itself significant at the .01 level.

[1]When one adds to these numbers, the frequency of instances in which differences approached significance, the series then reads six (FA), eleven (SN), and twelve (SP).

TABLE X111

PER CENT FREQUENCE IN WHICH COLUMN VARIANCE SIGNIFICANTLY EXCEEDS ROW VARIANCE AT THE 05 LEVEL OR BEYOND

Column	Row	C	FA	SN	SP	SR	ST
C		–					
FA		46.6**		6.7	13.3		
SN		33.4**			8.3		
SP		23.4**					
SR		70.8**	20.1**	32.8**	43.7**		10.9
ST		63.8**	13.3*	33.8**	35.0**		

*This difference in per cents is significant at the .05 level (two-tailed test).

**This difference in per cents is significant at the .01 level (two-tailed test).

Support is thus provided for Hypotheses H 1,2 through H 5,2 which predicted (in summary) that for each experimental treatment group, within-group variance would be greater than Control variance.

These results are difficult to assess. While they provide evidence that something happened in the experimental treatments to increase within-group rating variability, the nature of that "something" may only be conjectured. The supporting theory suggests that the connotative meanings of things are also influenced by highly individual circumstances, for instance, past experience. Thus, within a

given group, the treatments may have had quite different effects on Ss, particularly if pre-treatment differences existed in baseline tension states. The experimental treatments may have had the effect of partialing out the more hyperactive and more phlegmatic individuals. The basis for this speculation rests on Goldstein's (1964) and Balshan's (1962) observations that some individuals tend to be relatively hyperactive in comparative resting states. Furthermore, phlegmatic persons reveal a constant level of muscle tension whereas highly excitable people manifest rather dramatic variations in tension level. Such individual differences may have contributed to the variance reported above.

Eysenck (1966), writing in a similar vein, referred to the possibility that opposing behaviors may operate in given experimental treatments with the result that, unless these opposing tendencies are identified beforehand, treatment effects tend to cancel one another out. As the Goldstein-Balshan notion of opposing tension states might have relevance for the confounded findings reported in this study; so also might the failure to dichotomize subjects according to introversion-extraversion.

The Eysenck group (Eysenck, 1960; Eysenck and Claridge, 1962; Franks, 1961) have maintained that individuals manifest personality differences as a function of their central excitation-inhibition balance. In those

individuals, that is, introverts, in whom excitatory potentials predominate, inhibition builds up slowly. It follows that for such persons both tonic and phasic muscle contractions produce a higher frequency of proprioceptive impulses at higher levels and that this bombardment is maintained for longer periods of time than for individuals, that is, extraverts, in whom inhibitory potentials predominate. For people in the latter category, inhibition builds up quickly and results in a lower frequency of proprioceptive impulses at higher levels; this condition, moreover, endures for comparatively shorter periods of time. The implication is, then, that the nature of the excitation-inhibition balance existing at any given time for individuals will determine both the frequency and duration of increased proprioceptive impulses on the hypothalamus.

It is quite likely that, despite the supposedly normal nature of unselected university students, such a population contains persons who "tend" toward introversion (for example, anxiety neurotics, obsessive compulsives) as well as those who tend toward extraversion (for example, hysteric neurotics). If so, then the presumed, opposed reactions to induced alterations in tension states may have contributed to the reported variability within experimental groups and also to the regression of scores.

One may conclude that, with respect to the comparisons between each experimental group and the Control, experimental within-group variance is significantly greater in a significantly greater number of comparisons. Likewise, the SR and ST within-group variance is significantly greater than either the FA, SN, or SP within-group variance in a significantly greater number of comparisons. In other words, it appears that the effect of treatments on the ratings of the given concepts was that of reducing homogeneity of connotative meaning among experimental Ss in greater degree than was manifest among Control Ss; moreover, some experimental treatments, as reported earlier, (for example, SR and ST), produced more variable results than others (for example, FA, SN, and SP).

COMPARISON OF DIRECTIONAL SHIFTS IN RATINGS

A signed difference score, as defined in this study, is the algebraic difference between the pre-and post-test ratings assigned by any given S to any given concept. Where the signed difference was positive, the manifested shift in ratings occurred in the direction of the first-named term in the bipolar (for example, True); where the signed difference was negative, the shift in ratings occurred in the direction of the second term in the bipolar (for example, False).

Finally, a zero indicated no change between pre- and post-test ratings. It is stressed that the terms Positive and Negative are employed here in a directional, not evaluative context.

Tables XlV to XVlll report, on a scale-by-scale basis, the directional tendencies reflected in the reactions of groups toward concepts.

Several preliminary statements are in order: first, in reference to Tables XlV through XlX, the underlined per cents refer to instances in which the per cent of N rating toward one pole is significantly greater than the per cent rating toward the other pole. Second, since inspection of Tables XlV to XVlll reveals the presence of roughly uniform trends among ratings toward one or the other pole, counts were carried out for the scales on each dimension in order to determine the frequencies for which "pluses" exceeded "minuses," and *vice versa*. The difference between totals was then tested following the calculation of χ^2.

The writer reasoned, in following this procedure that, if a majority of Ss rated consistently, in the positive or negative direction over a set of scales, then this behavior followed a legitimately noteworthy trend.

The ratings trends are reported and discussed under the respective treatment headings.

TABLE XlV

DIRECTIONAL CHANGES IN FA RATINGS EXPRESSED
AS PER CENT OF GROUP (N=40)

Dimension	Scales \ Concepts	Abstr Art			Dreaming			Virility			Aviqusx			Myself			Totals		
		+	0	-	+	0	-	+	0	-	+	0	-	+	0	-	+	0	-
Evaluative	True-False	40	33	27	25	35	40	13	40	47	27	35	38	18	32	50			
	Clean-Dirty	23	40	38	20	50	30	20	38	42	25	35	40	13	55	52			
	Kind-Cruel	30	40	30	20	55	25	20	48	32	27	23	40	23	42	35			
	Wise-Foolish	23	42	35	20	42	38	25	35	40	19	40	31	18	65	18			
	Trend Totals	1	1	2	0	0	4	0	0	4	0	0	4	0	1	3	1	2	17
Potency	Strong-Weak	35	35	40	25	40	35	25	43	32	25	35	40	20	55	25			
	Interesting-Boring	15	47	38	20	50	30	30	40	30	32	45	23	20	53	27			
	Severe-Lenient	35	30	35	38	38	25	18	50	32	45	25	30	30	40	20			
	Deep-Shallow	27	40	32	38	38	25	27	53	20	40	35	25	30	42	27			
	Trend Totals	0	1	3	2	0	2	1	1	2	3	0	1	2	0	2	8	2	10
Activity	Active-Passive	35	35	30	38	16	46	13	40	47	58	16	26	24	50	26			
	Hot-Cold	35	35	30	27	50	23	23	50	27	23	38	40	25	55	20			
	Fast-Slow	47	35	18	27	46	27	18	52	30	27	35	27	42	40	18			
	Tense-Relaxed	27	27	46	27	40	33	20	38	42	38	40	23	32	45	23			
	Trend Totals	3	0	1	1	1	2	0	0	4	2	1	1	3	0	1	9	2	9

Facial Activity Effects

First, $H_{1,3}$ predicted a shift toward the negative pole for the evaluation ratings. The observed trend is reported as having occurred in this direction and the calculated χ^2 value of 14.22 shows the difference to be highly significant (.002).

The hypothesis clearly is supported.

Second, $H_{1,4}$ predicted no significant shift toward either pole. Since the χ^2 value of .22 is not significant, the hypothesis is supported.

Third, $H_{1,5}$ predicted a positive shift in ratings; however, no clear directional emerged as is evident from the χ^2 value of zero.

The hypothesis, therefore, is not supported.

The results of the Facial Activity treatment are noteworthy in at least two respects: first, the negative directional trend of the evaluative ratings was highly significant, whereas no clear trends emerged on the other dimensions. This phenomenon would suggest that the treatment certainly increased evaluative behavior on the part of a majority of subjects in this group. Second, the fact that this tensional state has no clearly defined referent among the known family of emotions, would imply that the effects of the treatment condition (rather than concepts) upon the

subjects was responsible for this dramatic effect. This inference is consistent with the author's rationale.

Stiff Neck Effects

First, $H_{2,3}$ predicted a significantly increased tendency to rate concepts negatively according to the evaluative dimension.

The computed χ^2 value of 8.00 is significant at the .002 level; therefore, the hypothesis is clearly supported by the data.

Second, $H_{2,4}$ predicted a significantly increased tendency to rate concepts as more potent. The trend, as observed, lies in the opposite direction although the computed χ^2 value of 1.39 is not significant.

The finding therefore fails to support this hypothesis.

Third, $H_{2,5}$ predicted a significantly increased tendency to rate concepts as more active. The computed value of χ^2 is reported as .22, and non-significant.

This finding fails to support the hypothesis.

Interpretation: The SN treatment, requiring, as it did, a high level of tension in the neighbouring, dorsal neck and shoulder muscles, was intended to parallel a common, though by no means unique, muscle tension condition among anxiety neurotics. The anticipated effects on

the ratings of concepts, namely, less favourable attitude, and increased tendencies to view concepts as potent and active, were predicted according to the disposition of anxious individuals to discouragement, to frustration, to dissatisfaction, to inhibition of action, to ineffective concentration, to inconsistent behavior, to defensiveness, to unjustifiable fluctuation of attitudes and feelings and other behaviors. (see Cattell and Schier, 1961).

Consequently, the suggested trend for the SN Ss toward less benign ratings of concepts, while slight, lies in the predicted direction; however, in line with Arnold's secondary appraisal function, the discomfort incurred by the strenuous stiff neck condition may have engendered feelings of dislike which, in turn, contributed to a negative rating bias.

The expected trend toward more potent ratings emerged only the Severe-Lenient scale (all five concepts) and the Deep-Shallow scale (Virility). It is suggested tentatively that the bipolars employed for this dimension acquired, to some extent, evaluative overtones; for example, note the <u>negative</u> trends on Interesting-Boring for the rating of Abstract Art, Virility, Aviqusx, and the almost negligible tendency to rate Myself positively.

Neither did the expected overall tendency to view concepts as more Active emerge, except for Abstract Art on

TABLE XV

DIRECTIONAL CHANGES IN SN RATINGS EXPRESSED
AS PER CENT OF GROUP (N=40)

Dimension	Scales \ Concepts	Abstr Art			Dreaming			Virility			Aviqusx			Myself			Totals		
		+	0	-	+	0	-	+	0	-	+	0	-	+	0	-	+	0	-
Evaluative	True-False	32	25	32	39	24	37	24	46	29	20	46	32	24	44	32			
	Clean-Dirty	30	45	25	15	53	32	17	44	39	22	49	29	10	63	27			
	Kind-Cruel	27	38	35	24	39	37	22	56	22	12	47	41	41	20	39			
	Wise-Foolish	27	33	40	19	49	32	12	61	27	18	41	41	19	54	27			
	Trend Totals	1	1	2	1	0	3	0	1	3	0	0	4	1	0	3	3	2	15
Potency	Strong-Weak	30	30	40	27	39	34	24	49	27	29	39	32	27	46	27			
	Interesting-Boring	15	40	45	20	56	24	19	44	37	17	46	37	24	58	18			
	Severe-Lenient	35	40	25	32	49	19	37	37	27	37	31	34	32	54	14			
	Deep-Shallow	23	45	32	29	37	34	42	29	29	19	49	32	17	46	37			
	Trend Totals	1	0	3	1	0	3	2	0	2	1	0	3	2	1	1	7	1	12
Activity	Active-Passive	27	35	45	37	31	31	29	39	32	37	19	44	19	53	28			
	Hot-Cold	42	42	15	17	61	22	22	54	24	29	51	20	17	61	22			
	Fast-Slow	30	43	25	35	41	24	24	46	30	22	37	41	20	58	22			
	Tense-Relaxed	38	43	20	41	35	24	37	46	17	27	44	29	53	34	13			
	Trend Totals	3	0	1	3	0	1	1	0	3	1	0	3	1	0	3	9	0	11

the Tense-Relaxed scale, Aviqusx on the Hot-Cold scale and Dreaming on the Fast-Slow scale. Again, the disposition of many Ss to view concepts as Tense may have been influenced to some extent by the bipolar terms.

Simulated Pleasure Effects

First, $H_{3,3}$ predicted an increased tendency to rate concepts positively. Since the reported χ^2 value of .60 is not significant, the hypothesis is not supported.

Second, $H_{3,4}$ predicted a decreased tendency to view concepts as potent. The evidence, reported as a highly significant (.002) χ^2 value of 10.88, strongly supports the hypothesis.

Third, $H_{3,5}$ predicted a decreased tendency to envisage concepts as active. Here, the fact that this tendency was manifest in all comparisons is reflected in the highly significant (.002) χ^2 value of 20.00.

The hypothesis is strongly supported.

Interpretation: It might be expected that under the relaxed, simulated pleasure condition, Ss would be rather languorous in their attitudes toward concepts. This tendency was clearly borne out in the potency and activity ratings. Yet the tendency toward a more benign view of Concepts did not emerge as generally as anticipated. Yet it is important to note that the concept Aviqusx which is neutral and therefore low in evaluativeness, bore out the prediction for all

evaluative scales. Again, one can recruit Arnold's theory of appraisal to suggest that, for the known concepts, the influence of the cortical component predominated over the proprioceptive and accordingly Ss rated these concepts much as they had done in the non-treatment condition.

One might hypothesize here that the more intensive, impelling state of joy, or ecstasy, if simulated, would have contributed to a positive finding on this dimension for all concepts.

Simulated Rage Effects

First, $H_{4,3}$ predicted an increased tendency to rate concepts negatively. This hypothesis is not supported by the evidence as the χ^2 value of .59 demonstrates.

Second, $H_{4,4}$ predicted a decreased tendency to rate concepts as potent. This hypothesis is not supported by the evidence as the χ^2 value of .22 demonstrates.

Third, $H_{4,5}$ predicted an increased tendency to rate concepts as active. Since the calculated χ^2 value of 2.25 does not attain significance, the hypothesis is not supported.

Interpretation: the fact that the directional trends reflect only a slight tendency in the hypothesized direction may be due to the fact that the simulated rage condition did not, for some Ss at least, replicate the effects associated with "blind" rage. Therefore, instead of rating concepts

TABLE XV1

DIRECTIONAL CHANGES IN SP SCALE RATINGS EXPRESSED
AS PER CENT OF GROUP (N=40)

Dimension	Scales \ Concepts	Abstr Art			Dreaming			Virility			Aviqusx			Myself			Totals		
		+	0	-	+	0	-	+	0	-	+	0	-	+	0	-	+	0	-
Evaluative	True-False	40	35	25	40	35	25	20	50	30	47	33	20	30	53	18			
	Clean-Dirty	20	45	35	25	48	27	25	50	25	27	55	18	18	60	23			
	Kind-Cruel	27	48	25	20	53	27	30	43	27	45	45	10	25	53	18			
	Wise-Foolish	18	33	50	38	30	32	20	53	27	39	39	22	18	55	27			
	Trend Totals	2	0	2	2	0	2	1	1	2	4	0	0	2	0	2	11	1	8
Potency	Strong-Weak	25	33	42	25	53	23	18	55	27	32	38	30	18	65	18			
	Interesting-Boring	18	60	23	8	65	27	25	48	27	18	60	22	15	55	30			
	Severe-Lenient	25	33	42	23	28	50	23	45	32	23	43	40	20	60	20			
	Deep-Shallow	25	45	30	27	38	35	25	35	40	23	45	32	23	45	32			
	Trend Totals	0	0	4	1	0	3	0	0	4	1	0	3	0	2	2	2	2	16
Activity	Active-Passive	20	35	45	11	44	44	13	53	35	22	44	33	6	40	54			
	Hot-Cold	20	55	25	10	65	25	23	45	32	20	45	35	18	50	32			
	Fast-Slow	13	48	40	20	40	40	15	48	38	30	35	35	27	43	30			
	Tense-Relaxed	20	40	40	18	38	45	25	38	38	25	48	27	8	52	40			
	Trend Totals	0	0	4	0	0	4	0	0	4	0	0	4	0	0	4	0	0	20

in the negative direction, some Ss were disposed to view some concepts more positively, for example, Abstract Art, Dreaming, and Virility (True-False) scale. However, on the same scale, Ss rated the neutral concept Aviqusx negatively. In this instance, the neutrality of the concept should have been expected to obviate the confounding effects, if present, of past experience.

Simulated Terror Effects

First, $H_{5,3}$ predicted an increased tendency to view concepts negatively. The hypothesis is supported as the χ^2 value of 5.82 (significant at the .01 level) demonstrates.

Second, $H_{5,4}$ predicted an increased tendency to view concepts as potent. Here, the calculated χ^2 value of .88 fails to lend support to the hypothesis.

Third, $H_{5,5}$ predicted an increased tendency to view concepts as active. The calculated value of χ^2 was 8.00, significant at the .002 level. The hypothesis therefore is strongly supported by the evidence.

Interpretation: these hypotheses were predicted upon the disposition of severely frightened individuals to view even harmless objects and situations as threatening, and previously valued objects and situations as "bad". The effects of a simulated terror posture while generally upholding expectations according to the reported evaluative

TABLE XV111

DIRECTIONAL CHANGES IN SR SCALE RATINGS EXPRESSED
AS PER CENT OF GROUP (N=43)

Dimension	Scales Concepts	Abstr Art +	Abstr Art 0	Abstr Art -	Dreaming +	Dreaming 0	Dreaming -	Virility +	Virility 0	Virility -	Aviqusx +	Aviqusx 0	Aviqusx -	Myself +	Myself 0	Myself -	Totals +	Totals 0	Totals -
Evaluative	True-False	39	30	30	44	26	30	37	37	26	28	35	37	26	51	24			
	Clean-Dirty	30	35	35	17	46	37	30	44	26	21	42	37	28	46	24			
	Kind-Cruel	23	32	44	35	30	35	23	35	42	--	--	--	26	44	30			
	Wise-Foolish	23	42	35	26	39	35	30	42	28	--	--	--	28	56	16			
	Trend Totals	1	0	3	1	1	2	3	0	1	0	0	2	3	0	1	8	1	9
Potency	Strong-Weak	28	39	32	26	35	39	23	56	21	32	49	19	16	65	19			
	Interesting-Boring	18	39	42	26	37	37	26	39	35	23	49	28	30	29	30			
	Severe-Lenient	49	26	25	42	26	32	28	37	35	37	35	28	32	44	24			
	Deep-Shallow	32	35	32	28	35	37	37	28	35	37	28	35	19	60	21			
	Trend Totals	1	1	2	1	0	3	2	0	2	3	0	1	1	1	2	8	2	10
Activity	Active-Passive	32	37	30	--	--	--	23	42	35	--	--	--	--	--	--			
	Hot-Cold	39	35	26	17	56	27	26	51	23	23	51	26	28	51	21			
	Fast-Slow	35	44	21	23	46	30	35	39	26	28	44	28	33	49	19			
	Tense-Relaxed	56	28	16	42	28	30	35	28	37	35	44	21	58	39	2			
	Trend Totals	4	0	0	1	0	2	2	0	2	1	1	1	3	0	0	11	1	5

findings, revealed some inconsistencies among responses, that is, a larger number of Ss rated Abstract Art as True and as Kind, than Ss who rated these concepts as False and Cruel.

Similar inconsistencies are manifested for the Potency dimension: for example, a number of Ss rated Abstract Art and Virility as _Weak_, whereas the remaining ratings in this scale tended to comply with predictions, that is, to rate these concepts as Strong.

Again, for the Activity dimension, we find the predicted trend was, overall, most clearly manifested in the ratings of the neutral concept, Aviqusx. But inconsistencies are noted here as well; the ratings of Dreaming and Virility on the _Active-Passive_ scale reveal slight trends in the _negative_ direction, as does the rating of Abstract Art on the Fast-Slow scale.

Control Group Activity Effects

Thus far, no consideration has been directed to trends in rating by Control Ss. Table XlX shows that across dimensions _no_ trends emerged. While a closer scrutiny of the ratings of concepts along given scales reveals that sizable differences occurred between "plus" and "minus" ratings, no explicable pattern emerges.

TABLE XV111
DIRECTIONAL CHANGES IN ST SCALE RATINGS EXPRESSED
AS PER CENT OF GROUP (N=48)

Dimension	Scales / Concepts	Abstr Art +	Abstr Art 0	Abstr Art -	Dreaming +	Dreaming 0	Dreaming -	Virility +	Virility 0	Virility -	Aviqusx +	Aviqusx 0	Aviqusx -	Myself +	Myself 0	Myself -	Totals +	Totals 0	Totals -
Evaluative	True-False	38	38	25	25	29	46	35	35	29	31	38	31	21	54	25			
	Clean-Dirty	25	42	33	25	42	33	23	44	33	29	40	31	21	52	27			
	Kind-Cruel	35	35	29	27	38	35	33	33	33	25	20	55	23	48	29			
	Wise-Foolish	23	31	46	23	48	29	31	38	31	25	35	40	33	48	19			
	Trend Totals	2	0	2	0	0	4	1	2	1	0	1	3	1	0	3	4	3	13
Potency	Strong-Weak	27	40	33	38	29	33	19	52	29	40	29	31	27	54	19			
	Interesting-Boring	25	45	29	25	52	23	21	50	29	31	42	27	25	48	27			
	Severe-Lenient	40	33	27	42	33	25	42	29	29	33	29	38	35	44	21			
	Deep-Shallow	23	42	35	29	44	27	42	40	19	38	25	38	25	50	25			
	Trend Totals	1	0	3	4	0	0	2	0	2	2	1	1	2	1	1	11	2	7
Activity	Active-Passive	44	27	27	25	40	35	21	50	29	42	17	27	53	35	12			
	Hot-Cold	27	52	21	31	52	17	25	54	21	33	40	27	25	52	23			
	Fast-Slow	27	38	35	25	50	25	29	52	19	48	25	27	25	50	25			
	Tense-Relaxed	44	42	15	29	44	27	42	27	31	40	31	29	60	31	9			
	Trend Totals	3	0	1	2	1	1	3	0	1	4	0	0	3	1	0	15	2	3

Comparison of Verbal Reports on the Felt Effects of Treatments

It will be recalled that, following the second set of ratings, Ss were directed to describe in what respect, if any, they felt differently during the treatment and non-treatment rating situations. Since E's directions were unstructured, the results reported in Table XX are volunteered effects, based on the salient feelings noticed by Ss. It is conceivable that if specific questions, relating to felt effects had been asked, a higher frequency of responses might have occurred.

The underlying purpose of the verbal reports, notwithstanding the sometimes doubtful veracity of introspected evidence, was to obtain a check on the data obtained by the semantic differential. To the extent that a commonality of treatment reactions is trustworthy, attention has been directed to the reporting, in Table XX, of only those reactions which were volunteered by <u>two</u> or more Ss.

First, it is noted that the reported reactions lend support to the directional hypotheses. That is, 5 per cent and 34 per cent of the FA and SP groups reported more benevolent reactions toward concepts; whereas, 15 per cent, 22 per cent, 23 per cent, and 35 per cent of respectively, the FA, SN, ST, and SR groups, reported more critical attitudes.

TABLE X1X

DIRECTIONAL CHANGES IN C SCALE RATINGS EXPRESSED AS PER CENT OF GROUP (N-56)

Dimension	Scales \ Concepts	Abstr Art			Dreaming			Virility			Aviqusx			Myself			Totals		
		+	0	-	+	0	-	+	0	-	+	0	-	+	0	-	+	0	-
Evaluative	True-False	34	37	39	30	44	26	14	56	30	35	49	16	28	58	14			
	Clean-Dirty	13	54	34	28	46	26	23	47	30	30	56	14	11	72	17			
	Kind-Cruel	18	64	18	28	53	19	26	51	23	22	48	30	16	63	21			
	Wise-Foolish	27	50	23	21	54	25	14	51	35	22	52	26	24	67	9			
	Trend Totals	1	1	2	3	0	1	1	0	3	2	0	2	2	0	2	9	1	10
Potency	Strong-Weak	32	39	29	25	49	26	21	61	18	33	42	25	24	65	11			
	Interesting-Boring	29	62	9	9	58	33	18	49	33	16	56	28	19	65	16			
	Severe-Lenient	21	45	32	19	49	32	19	61	19	14	49	37	25	63	13			
	Deep-Shallow	14	54	32	30	54	16	32	49	19	30	33	37	26	63	11			
	Trend Totals	2	0	2	1	0	3	2	1	1	1	0	3	4	0	0	10	1	9
Activity	Active-Passive	20	36	45	15	33	52	23	44	33	30	44	26	16	67	18			
	Hot-Cold	27	54	20	16	68	26	24	54	21	30	49	21	16	68	16			
	Fast-Slow	18	46	36	10	53	37	16	54	30	30	49	21	21	56	23			
	Tense-Relaxed	23	39	38	32	47	21	28	49	23	30	44	26	19	67	14			
	Trend Totals	1	0	3	1	0	3	2	0	2	4	0	0	1	1	2	9	1	10

TABLE XX

COMPARISON OF VERBAL REPORTS OF FELT REACTIONS TO TREATMENTS

Reaction tendencies stated as results of treatments	C (N-32)	FA (N-40)	ST (N-45)	SP (N-29)	SN (N-38)	SR (N-43)
1. Toward Concepts						
More favourable reaction	-	5%	-	34%	-	-
Less favourable reaction	-	15%	23%	-	22%	35%
Claimed, although unspecified, difference	6%	-	5%	10%	5%	-
Little or no difference in attitude toward concepts	47%	10%	10%	21%	-	9%
11. General Reaction						
Increased disinterest in experiment	19%	8%	4%	10%	5%	2%
Increased ability to think clearly and decisively	-	13%	-	-	5%	5%
Decreased ability to think clearly and decisively	-	32%	27%	7%	15%	23%
Increased ability to render decisions quickly	-	13%	-	-	-	-
Aroused feelings of well being	6%	-	-	16%	-	-
Aroused feelings of general annoyance and frustration	9%	10%	10%	-	7%	16%
Aroused feelings of anger or hostility	-	-	-	-	-	16%
Increased openness and spontaneity of response	-	22%	6%	-	-	9%
Aroused feelings of fatigue or discomfort	-	10%	11%	-	20%	-
Felt pressure or urgency to respond quickly	-	-	17%	-	29%	12%

Second, certain verbally reported effects of a more miscellaneous nature are worthy of mention:

(a) The Control Ss, in greater degree than experimental Ss, found the experimental session increasingly boring as time elapsed. Possibly, since many Freshmen possess the sophistication to recognize whether they have been assigned to a control or an experimental group, some control Ss may have felt "let down" and became uninterested in the proceedings.

(b) Some Ss, notably 13 per cent of the FA group, reported that they could think more clearly and decisively about concepts, while 32 per cent of the same group reported a decreased ability to concentrate. This latter tendency was also reported by 27 per cent, 23 per cent, 15 per cent, and 7 per cent of, respectively, the ST, SR, SN, and SP groups. Note here that this ordering of per cents corresponds closely to the pattern reported earlier for treatment effects on mean rating shifts and variances.

To what extent the maintenance of the treatment conditions interfered with the rating tasks, is not known. Several Ss in the FA, SN, SR, and ST groups did volunteer that they had experienced difficulty in attending simultaneously to the two tasks.

(c) Some subjects reported the arousal of various

feelings in association with ratings under the treatment condition. For example, 16 per cent of the SP Group stated they felt "better" or "more relaxed" or more "serene." In addition, 6 per cent of the Control Group and 2 per cent of the FA Group reported essentially similar reactions.

In contrast, varied percentages (varying from 7 per cent of the SN Ss to 16 per cent of the SR Ss) reported increased feelings of annoyance and frustration. Moreover, the reactions of certain SR Group members merits particular attention; it appears that 16 per cent of this group felt increased annoyance (in several instances described as a "vague" feeling); an additional 16 per cent described their reactions as approaching real anger or hostility.

This set of findings does, of course, lend support to the hypotheses about the proposed direction of ratings, yet causes one to wonder why greater numbers of Ss did not report similar reactions. (The possible reasons for the failure of many Ss to do so will be considered in Chapter Vl.)

(d) A number of subjects described their felt reactions to treatment as increased "openness about how they felt," as greater "spontaneity," or increased "impulsiveness". This tendency was most manifest among FA Ss since 22 per cent reported this reaction. Also, 9 per cent and 6 per cent of the SR and ST groups mentioned a similar reaction.

This reaction can be interpreted in "arousal" terms; for the Ss reporting this effect, the effects of treatment appeared, in some instances, to have raised (or, in some instances, lowered) arousal to a level which facilited cortical functioning. It is noted that the numbers of SR and ST Ss reporting this effect are small; this fact is not surprising since these Ss had been directed to impose tension of an intense level upon the muscles.

(e) Fatigue effects were noted by 20 per cent of the SN, 11 per cent of the ST, and 10 per cent of the FA groups. That the greater number of complaints originated among SN Ss, is of interest. Neurotic muscular disorders are fatiguing although, usually, because they are of a chronic nature. It is of additional interest that several SN Ss, immediately following the experimental sessions, complained of headaches; this complaint is also associated with neurotic tension states.

(f) The effect of treatment as noted by 13 per cent of the FA Ss was to accelerate noticeably the ability to make decisions quickly. The Ss in other experimental groups, specifically 29 per cent of the SR group, felt "under pressure" to respond quickly. The SN Ss who reported this reaction explained the tendency on the grounds of wishing to escape an uncomfortable situation.

The Summary

The evidence from this quarter would suggest that, for a minority of individuals in each of the experimental groups, the treatments did elicit the reactions hypothesized according to the particular condition simulated by Ss. Hence, some SP Ss tended to manifest approach behavior toward concepts and more relaxed themselves. On the other hand, the FA, SN, SR, and ST Ss tended to manifest more avoidant behavior toward concepts, to concentrate less clearly during the rating task, and to experience tensions variously described as annoyance, frustration, or anger.

CHAPTER V1

SUMMARY, DISCUSSION, AND CONCLUSIONS

SUMMARY AND DISCUSSION

A number of hypotheses, all related to the general proposition that consciously mediated alterations in muscle tension must be accompanied by associated alterations in the connotative meanings of concepts, were tested by semantic differential technique.

The experimental treatments were differentiated as follows:

Simulated Terror: intense contraction of limb and trunk muscles and also those which sustain eyes and mouth in wide open positions.

Simulated Rage: the required tension state, while intense, was not as widespread as for the ST group. Here the subjects tensed lips, jaws, and fists and in addition, were required to maintain an erect sitting position with weight on the balls of the feet.

Stiff Neck: Here, muscle tension was localized in the dorsal neck and shoulder muscles, that is, those muscles which maintain the head in an upright, antigravity position during which the body is leaned slightly forward.

Facial Activity: The induced contractions required in this treatment involved the phasic sort in which subjects were required to maintain a fairly rapid and changing pattern

of wide amplitude movements in the muscles of the brow, nose, cheeks, jaws, and mouth.

Simulated Pleasure: Within the constraints imposed by a sitting position, subjects were required to relax their bodies as fully as possible and also to maintain mouths in a smiling expression and to relax eyelids.

This review of the experimental treatments serves to emphasize the crude but accurate gradation of intensity levels which distinguish between the induced tonic contraction patterns, that is, the order of intensities of treatment from greatest to least are as follows: ST, SR, SN, and SP. According to this classification of treatments, the facial activity pattern must be assigned to a class by itself.

One is reminded also that the above tonic contraction patterns are conventionally identified with, respectively, the emotions of terror, rage, anxiety, and pleasure. Therefore, not only the intensity characteristics of the treatment but the emotion relatedness of the muscle contraction patterns constituted the important independent variables. According to the hypothesized effects of treatments in the rating of concepts, the magnitude of any resulting shift would be a function of treatment intensity and, in addition, the directionality of any

resulting rating shift would be an expression of the particular emotion simulated.

Therefore, since in this experiment, the reported results were expected to reflect treatment differences, no attempt was made to combine treatment results (across groups) for statistical purposes. Such procedure would have been essentially meaningless.

The experimental results lend modest though definite support to the general proposition stated above, while recognizing that, first, not all treatments produced conclusive findings from a scale-by-scale and concept-by-concept analysis and, second, experimental treatments should in any event be expected to elicit some reactive effects as a result of suggestion, 'second-guessing' the experimenter, etc.

The logical point at which to begin a discussion of the findings is the analysis of variance data. Here, the point to be made is that significant differences between experimental and control mean difference scores occurred in the following percentages of possible instances: ST (23), SR (20), SN (7), FA (7) and SP (3). It is noted that chance expectations are exceeded for the first two frequencies and also that the order of these frequencies parallels the ordering of muscle contraction intensities. Here, then is evidence that the more intense, and more widespread, muscle tension states, contributed to changes in connotative

meaning. Further, this ordering effect suggests that such changes in meanings were proportional to the proprioceptive intensities.

It may be asserted that this ordering effect undermines the possibilities that the reported changes occurred simply because of reactions between treatments and subjects (such reactions being brought about by subjects' realization that they were participating in an experiment), since such reactive effects should not also demonstrate the ordering effect.

Why were more dramatic results, for all treatments, not obtained? One might reasonably suspect that there is no single answer to this question. Here again the fact that the results fit the expected pattern admittedly does suggest a lack of sensitivity for the particular semantic differential device used here. If true, different variants of the instrument should be tried out. Another possibility, inspired by the findings of Balshan (1962), Goldstein (1964), and Eysenck (1966), deserves more serious consideration. This refers to the lack of pre-treatment knowledge concerning baseline tension levels among subjects. It is conjectured here that even if randomization procedures had distributed such differences evenly among the control and experimental groups as expected, then the effect of experimental treatments on chronically tense subjects would be to reduce the

prospects for the wide shifts in meanings expected among less tense individuals. Moreover, this phenomenon might have been expected to occur without detriment to the predicted ordering of results according to treatment intensities. It will be clearly apparent that any replication of this study should take pre-treatment tension states into account.

The variance findings were quite conclusive in demonstrating that within-group variability for all treatment groups exceeded control group variability in a significant number of comparisons and that these effects were most pronounced among the ST and SR groups and least among SP subjects.

It is suggested that, in addition, the effects of altered tension states appeared to alter the connotative meanings of concepts to greater extent for some subjects than it did for others. It has already been mentioned that any experimental treatment may be expected to reduce homogeneity; however, the ordering effect noted for these results should not be attributed to error variance. The more intensive muscle contraction states required of ST and SR subjects, for example, may be judged as particularly evocative of reduced homogeneity of connotative meaning.

The discussion has related, up to this point, to the magnitude of treatment effects on the rating of concepts without reference to the expressed directionality treatment-

inspired rating shifts. This latter topic is of special interest since if one can, through conscious alteration of skeletal muscle tension, also alter the connotative meanings of stimulus situations, then this phenomenon contains practical significance.

The experimental findings which relate to the effects of the different treatments on rating directionality are conclusive to the extent that rating tendencies observed for majorities of subjects are reliable--in the aggregate sense. It will be recalled that, for each treatment group, positive and negative rating frequencies were counted along each scale across concepts and the differences between the totals were then tested by means of χ^2. The results have shown that rather interesting results emerged; however, one must be mindful that these results really only reveal the presence of directional trends.

Significant directional trends emerged in seven of the fifteen comparisons. Since all seven instances were in accord with the hypotheses, it profits the discussion to recall that, according to the supporting rationale of this study, the directional effects on concept ratings which were predicted for the various experimental treatments could be attributed to the estimated evaluative, potency and activity connotations of the concepts for

subjects, and also to the added effect of treatment on each experiencing subject, that is, in terms of the appraised benefit or appraised aversive quality of the treatment.

The reported directionality of rating behavior is discussed under the treatment headings, as follows:

Simulated Terror

The hypothesized increase in the negative evaluations of concepts was supported, as was the hypothesized increase in the tendency to view concepts as active. If the effect of induced proprioceptive feedback was to bestow upon concepts the connotative meanings that arise in the actual terror condition, we might then readily expect this result; moreover, we might also expect that the evaluative connotations of concepts would be provided additional negative colouring through reactions of subjects to the fear experience. This line of reasoning is also in accord with the views of Arnold and Osgood.

A somewhat similar interpretation may be placed upon the potency findings: if subjects in a simulated terror posture react as individuals who experience real terror, potency may be attributed unrealistically to a host of otherwise impotent entities. The results suggest that some subjects, at least, complied with the expectation, but not in sufficient number to achieve statistical significance for the finding.

Osgood (1957) has suggested that potency ratings may acquire evaluative overtones and therefore the results might have been confounded by subjects who reacted to concepts in evaluative terms. This possibility is given strength by the additional possibility that subjects may have reacted evaluatively on the secondary appraisal level to the treatment condition itself.

According to the results, a significantly large number of subjects reacted to this treatment by attributing activity to concepts. The interpretation here is similar to that offered for behavior on the potency scales, that is, under the simulated and real fear states, individuals may be disposed to read activity into static situations. Confounding possibilities similar to those described above are admissible here as well.

Simulated Rage

None of the hypothesized directional tendencies were borne out. According to the rationale adopted in the discussion of ST results, the SR effects are somewhat inexplicable. The predicted negative evaluative ratings were based on the proposition that the rage condition does not impel one to view things more benignly; moreover, neither should the felt experience of rage be expected to bestow positive affect during appraisal of stimuli. The possibility that

more confounding influences exist than 'meet the eye' will be discussed in a following section.

The identity of confounding influences is more readily resolved for the potency findings. Under influence of a simulated rage condition, it was proposed that subjects would be more disposed than in a normal state to manifest increased positive rating tendencies. On the other hand, the results of secondary appraisal, that is, the effect on subjects of the SR condition, should have been expected to demonstrate a negative bias in rating behavior. The reported result might readily have been predicted instead.

The activity ratings, also negative, may be accounted for in the same terms as those presented for the potency findings.

<u>Stiff Neck</u>

The one positive result reported shows an increased tendency on the evaluative scales to rate concepts in the negative direction. Since this anxiety-simulated condition and that of terror involve kindred emotions, the results may be similarly interpreted.

The potency and activity results did not attain statistical significance. As reported for the ST results, the potency ratings may have been imbued with evaluative overtones and, indeed, a negative bias is apparent in these ratings. No comment is offered here concerning the activity findings.

Simulated Pleasure

Under the treatment condition of relaxed muscles, it was predicted that subjects would be more inclined to rate concepts in the positive direction. This was not borne out by the findings, except, interestingly enough, in the ratings of the neutral concept, Aviqusx. While more will be said later concerning the ratings of this particular concept, the identity of the confounding influences which contributed to this overall finding is open to conjecture.

The potency and activity results are more readily explained: in a relaxed state, the proprioceptive feedback from the muscles should have been expected to attenuate cortical activities somewhat. In turn, the appraisal function should have been unlikely to result in either an increased potency or increased activity rating.

Facial Activity

Because this treatment would appear to lack emotional relatedness, the predicted directionality of treatment-inspired ratings was derived from the hypothesized secondary appraisal effects. According to this, the effects of experiencing this treatment and the associated feelings of silliness, embarrassment, and the like, should have resulted in negative evaluative response tendencies. This prediction was, in fact, supported.

No directional change was predicted for potency ratings since it was believed contrary appraisals of the treatment condition were anticipated for subjects in this group, that is, some would feel threatened by this unconventional behavior and would, like anxious subjects, attribute increased potency to concepts. Others were expected to "let go" and to carry out ratings in a spontaneous manner. In this latter circumstance, ratings had been expected to reflect decreased potency.

The hypothesis of an increased tendency to attribute activity to concepts was not supported, presumably because of the same kind of contrary reactions noted for the potency ratings.

In summary, the evidence relating to manifest effects of treatments on rating directionality lends modest support to the hypotheses but leaves the author in the position of wishing he could learn more about other bases according to which subjects might conceivably have rated the concepts, particularly in those instances for which the data did not attain significance. The present evidence may be taken to suggest that insofar as directionality effects are concerned, treatments did influence change for some subjects. However, the influence of memory on rating behavior was not controlled, neither was the fact that the logical relation between concepts and bipolar terms was more apparent for many subjects.

Very likely there are many variables operating here and their weights, employing our present modes of analysis, would be difficult to determine.

The ratings of the neutral concept, Aviqusx, tend to bear out these conjectures. Certainly here, past experience could not influence the ratings. Indeed, the concept was selected in order to permit the controlled variables to exercise their effects without contamination. Some evidence may be presented to show that in those instances in which significant directional trends were not demonstrated, the ratings of Aviqusx did, on the other hand, support the predictions, e.g. the evaluative ratings by the SP and SR groups. In other instances, the Aviqusx ratings did not support the hypotheses in greater degree than did ratings of other concepts.

Finally, the evidence provided by the introspective reports may be construed as evidence that treatments induced the hypothesized effects; however, a minority of subjects volunteered this data.

CONCLUSIONS

The results give rise to the following generalizations:

First, the experimental evidence revealed that some individuals, while under the influence of consciously

induced contraction patterns in the skeletal muscles and varied contractions of the facial muscles, will rate concepts differently from those subjects rating the same concepts under normal or non-treatment conditions.

Second, the magnitude of change in connotative meaning associated with the consciously mediated alterations in muscle tension, is proportional to the intensity and frequency of muscle contractions.

It was reported among the results, for instance, that since the conditions of Simulated Rage and Terror involved intense muscle contractions over a greater portion of the musculature than was characteristic of the remaining treatment conditions, more pronounced shifts in meaning also occurred.

Third, for any given individuals, it would appear that in addition to existing baseline tension states, other factors, as yet unidentified, contribute to the extent of influence on connotative meaning.

IMPLICATIONS OF THE STUDY FOR GUIDING HUMAN BEHAVIOR

Since the study suggests that for given individuals tension states in the skeletal muscles may be consciously altered with demonstrable effects on their attitudes toward concepts, it is also suggested that individuals might, with training and practice in the deliberate modulation of

tension states in the skeletal muscles, be enabled to modify their attitudes towards things. Therefore, an aroused, negatively reacting person should be enabled to view a situation more benignly by consciously relaxing the skeletal muscles or by promoting other more appealing, enjoyable activities. The technique is, of course, not unfamiliar; the teen-age son waits until his father has eaten and (it may be hoped) enjoyed his dinner before raising the possibility of borrowing the family car.

Moreover, the study suggests the possible extension of the strategy to the treatment of a wide range of hampering emotional states. By inducing moderately increased or decreased phasic or tonic activity in the muscles, the arousal level may be increased or decreased correspondingly with the result that problem solving or motor efficiency is improved.

IMPLICATIONS FOR FURTHER RESEARCH

A replication of this study requires that consideration be directed to the following departures from the design employed above:

1. The selection of concepts might be based on semantic differential findings. The value of this tactic would be that of ensuring that the concepts selected for the study held from the outset, reasonably similar connotative

meanings for subjects. A further advantage of this tactic would be that of identifying, systematically, concepts which ranged from neutral to high emotional loading.

2. The selection of subjects might be directed to groups outside the university, for example, representing children, different religious denominations, or different socio-economic backgrounds.

3. The time allotted to instruction and practice in the deliberate alteration of muscular tension might be extended to ensure that subjects are able to maintain given postural conditions while giving their full attention to the rating tasks.

4. The treatments might be extended to include the simulation of other emotions, for example, sadness or surprise.

5. As an alternative to rating concepts, attention might be directed to the effects of treatment on perception, problem-solving, or the performance of motor skills.

6. Especially, some method of identifying initial baseline tension states is indicated.

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A P P E N D I C E S

APPENDIX A

THE EFFECTS OF CONSCIOUSLY INDUCED MUSCULAR TENSION STATES ON CONNOTATIVE MEANING

—— A PILOT STUDY ——

APPENDIX A

The Effects of Consciously Induced Muscular Tension States on Connotative Meaning: a Pilot Study

This is the report of an experiment designed to test Gellhorn's (1964) proposition that consciously-mediated tonic and phasic alterations of muscle tension is accompanied by associated alterations in affective behavior. The substantive hypotheses proposed for test by the writer were:

1. Through a consciously induced and maintained postural alteration of the skeletal muscles, individuals will rate an inanimate object differently on the semantic differential scales than in a resting or relaxed state.

2. Through a consciously induced and maintained phasic pattern of alterations in facial muscle patterns, individuals will rate an inanimate object differently on semantic differential scales than under a relatively mild tonic state of the facial and skeletal muscles typical of a resting or relaxed state.

Experimental Design

The Ss, fifty-one Freshmen males and sixty Freshmen females randomly selected, educational psychology students, were divided equally by six into four experimental and two control groups.

The control tasks consisted of rating on twelve semantic differential scales the "personality," as perceived, of the sculptured bust of an adult male figure. Following fifteen minutes of irrelevant conversation, Ss were required to re-rate the object on the same twelve scales.

The experimental tasks were identically the same as the above except that re-ratings were carried out under two different treatment conditions:

1. Two groups, respectively male and female, were assigned a "Fixed Posture" treatment which required that Ss deliberately impose a state of tension in the muscles of limbs, trunk, and face, and to sit in a "ready-to-go" position with the weight resting on the balls of the feet. While sustaining this posture, Ss re-rated the stimulus figure.

2. Two groups, respectively male and female, were assigned a "Varied Facial Pattern" treatment which required that Ss alter their facial features, as rapidly and in as many ways as possible. While sustaining this condition they re-rated the stimulus figure. Each experimental treatment featured a period of instruction and practice; also for half of each experimental group the neutral and treatment ratings were conducted in reverse order.

Statistical Treatment

A two-way analysis of variance (least squares) of the three conditions and two sexes was applied for each of the twelve scales. For the purposes of the study a "score" was designated as the amount of absolute deviation between test and re-test for each item in the twelve scales. The levels of confidence selected, using two-tailed tests, were the .05 and .01 levels.

Results

1. Significant differences among treatment means were revealed by F-tests for the following scales: Kind-Cruel, Hot-Cold, Strong-Weak, and Interesting-Boring.

2. The application of t-tests revealed the breakdown of significant differences per scale, as follows:

Kind-Cruel: The differences in means between all experimental and control groups were significant at the .01 level.

Hot-Cold: The difference between Fixed Posture (female) and Control groups was significant at the .05 level; and between the Varied Expression (female) and both Control groups the differences were significant at the .01 level.

Strong-Weak: The difference between the Fixed Posture (female) and Control (male) groups was significant at the .05 level.

Interesting-Boring: The differences between both experimental groups (male) and control (male) were significant at the .01 level, between the Varied Expression group (male) and Controls (female) at the .01 level, and between the Varied Expression (male) and Controls (male) at the .05 level.

3. Within-group variance, significant at the .01 level was noted, on the Hot-Cold scale, between the Fixed Posture (female) and each of the Fixed Posture (male) and Control (male) groups.

4. An interaction effect, significant at the .05 level was noted only for the Interesting-Boring scale. This sex difference could be attributed to chance.

Conclusion

The results indicated a modest though definite measure of support for the two hypotheses: that is, some individuals, while under the influence of either maintained tension in the skeletal muscles or varied phasic contractions of the facial muscles, will rate an object somewhat differently than in a relaxed, resting condition.

APPENDIX B

Semantic Differential Scales

and Instructions

APPENDIX B

BOOTH NUMBER ________

DATE ______________

INSTRUCTIONS.

The purpose of this study is to measure the meanings of certain things to various people by having them judge them against a series of descriptive scales. In taking this test, please make your judgments on the basis of what these things mean to you. On each page of this booklet you will find a different concept to be rated and beneath it a set of scales. You are to rate the concept on each of the scales, in order.

Here is how you are to use these scales:

If you feel that the concept at the top of the page is very closely related to one end of the scle, you should place your check-mark as follows:

Fair __X__:_____:_____:_____:_____:_____:_____ unfair

or

fair _____:_____:_____:_____:_____:_____:__X__ unfair

If you feel that the concept is quite closely related to one or the other end of the scale (but not extremely), you should place your check-mark as follows:

strong _____:__X__:_____:_____:_____:_____:_____ weak

or

strong _____:_____:_____:_____:_____:__X__:_____ weak

If the concept seems only slightly related to one side as opposed to the other side (but is not really neutral), then you should check as follows:

active _____:_____:__X__:_____:_____:_____:_____ passive

or

active _____:_____:_____:_____:__X__:_____:_____ passive

If you consider the concept to be neutral on the scale, both sides of the scale equally associated with the concept, or if the scale is completely irrelevant, unrelated to the concept, then you should place your mark in

the middle space:

safe _____: _____:_____:_____: X __:_____:_____ dangerous

IMPORTANT:

(1) Place your check-marks in the middle of spaces.
(2) Be sure to check every scale for every concept- do not omit any.
(3) Never put more than one check-mark on a single scale.

Sometimes you may feel as though you have had the same item before on the test. This will not be the case, so do not look back and forth through the items. Do not try to remember how you checked similar items earlier in the test. Make each item a separate and independent judgment. Work at fairly high speed through this test. Do not worry or puzzle over individual items. It is your first impressions, the immediate "feelings" about the items, that we want. On the other hand, please do not be careless, because we want your true impressions.

STOP

Do not turn page until instructed.

ABSTRACT ART.

True ______:______:______:______:______:______:______ False

Clean ______:______:______:______:______:______:______ Dirty

Kind ______:______:______:______:______:______:______ Cruel

Wise ______:______:______:______:______:______:______ Foolish

Strong ______:______:______:______:______:______:______ Weak

Interesting ______:______:______:______:______:______:______ Boring

Severe ______:______:______:______:______:______:______ Lenient

Deep ______:______:______:______:______:______:______ Shallow

Active ______:______:______:______:______:______:______ Passive

Hot ______:______:______:______:______:______:______ Cold

Fast ______:______:______:______:______:______:______ Slow

Tense ______:______:______:______:______:______:______ Relaxed

STOP

Do not turn page until instructed.

DREAMING.

True	___ :	___ :	___ :	___ :	___ :	___ :	___	False
Clean	___ :	___ :	___ :	___ :	___ :	___ :	___	Dirty
Kind	___ :	___ :	___ :	___ :	___ :	___ :	___	Cruel
Wise	___ :	___ :	___ :	___ :	___ :	___ :	___	Foolish
Strong	___ :	___ :	___ :	___ :	___ :	___ :	___	Weak
Interesting	___ :	___ :	___ :	___ :	___ :	___ :	___	Boring
Severe	___ :	___ :	___ :	___ :	___ :	___ :	___	Lenient
Deep	___ :	___ :	___ :	___ :	___ :	___ :	___	Shallow
Active	___ :	___ :	___ :	___ :	___ :	___ :	___	Passive
Hot	___ :	___ :	___ :	___ :	___ :	___ :	___	Cold
Fast	___ :	___ :	___ :	___ :	___ :	___ :	___	Slow
Tense	___ :	___ :	___ :	___ :	___ :	___ :	___	Rlaxed

STOP

Do not turn page until instructed.

VIRILITY.

True	____	____	____	____	____	____	____	False
Clean	____	____	____	____	____	____	____	Dirty
Kind	____	____	____	____	____	____	____	Cruel
Wise	____	____	____	____	____	____	____	Foolish
Strong	____	____	____	____	____	____	____	Weak
Interesting	____	____	____	____	____	____	____	Boring
Severe	____	____	____	____	____	____	____	Lenient
Deep	____	____	____	____	____	____	____	Shallow
Active	____	____	____	____	____	____	____	Passive
Hot	____	____	____	____	____	____	____	Cold
Fast	____	____	____	____	____	____	____	Slow
Tense	____	____	____	____	____	____	____	Relaxed

STOP

Do not turn page until instructed.

AVIQUSX.

True	___	___	___	___	___	___	___	False
Clean	___	___	___	___	___	___	___	Dirty
Kind	___	___	___	___	___	___	___	Cruel
Wise	___	___	___	___	___	___	___	Foolish
Strong	___	___	___	___	___	___	___	Weak
Interesting	___	___	___	___	___	___	___	Boring
Severe	___	___	___	___	___	___	___	Lenient
Deep	___	___	___	___	___	___	___	Shallow
Active	___	___	___	___	___	___	___	Passive
Hot	___	___	___	___	___	___	___	Cold
Fast	___	___	___	___	___	___	___	Slow
Tense	___	___	___	___	___	___	___	Relaxed

STOP

Do not turn page until instructed.

MYSELF.

True	____	____	____	____	____	____	____	False
Clean	____	____	____	____	____	____	____	Dirty
Kind	____	____	____	____	____	____	____	Cruel
Wise	____	____	____	____	____	____	____	Foolish
Strong	____	____	____	____	____	____	____	Weak
Interesting	____	____	____	____	____	____	____	Boring
Severe	____	____	____	____	____	____	____	Lenient
Deep	____	____	____	____	____	____	____	Shallow
Active	____	____	____	____	____	____	____	Passive
Hot	____	____	____	____	____	____	____	Cold
Fast	____	____	____	____	____	____	____	Slow
Tense	____	____	____	____	____	____	____	Relaxed

STOP

Do not turn page until instructed.

ABSTRACT ART

Kind	______	______	______	______	______	______	Cruel
Clean	______	______	______	______	______	______	Dirty
Wise	______	______	______	______	______	______	Foolish
True	______	______	______	______	______	______	False
Severe	______	______	______	______	______	______	Lenient
Interesting	______	______	______	______	______	______	Boring
Deep	______	______	______	______	______	______	Shallow
Strong	______	______	______	______	______	______	Weak
Fast	______	______	______	______	______	______	Slow
Hot	______	______	______	______	______	______	Cold
Tense	______	______	______	______	______	______	Relaxed
Active	______	______	______	______	______	______	Passive

STOP

Do not turn page until instructed

DREAMING

Kind	______ :	______ :	______ :	______ :	______ :	______ :	______	Cruel
Clean	______ :	______ :	______ :	______ :	______ :	______ :	______	Dirty
Wise	______ :	______ :	______ :	______ :	______ :	______ :	______	Foolish
True	______ :	______ :	______ :	______ :	______ :	______ :	______	False
Severe	______ :	______ :	______ :	______ :	______ :	______ :	______	Lenient
Interesting	______ :	______ :	______ :	______ :	______ :	______ :	______	Boring
Deep	______ :	______ :	______ :	______ :	______ :	______ :	______	Shallow
Strong	______ :	______ :	______ :	______ :	______ :	______ :	______	Weak
Fast	______ :	______ :	______ :	______ :	______ :	______ :	______	Slow
Hot	______ :	______ :	______ :	______ :	______ :	______ :	______	Cold
Tense	______ :	______ :	______ :	______ :	______ :	______ :	______	Relaxed
Active	______ :	______ :	______ :	______ :	______ :	______ :	______	Passive

STOP

Do not turn page until instructed.

VIRILITY

Kind	____	____	____	____	____	____	____	Cruel
Clean	____	____	____	____	____	____	____	Dirty
Wise	____	____	____	____	____	____	____	Foolish
True	____	____	____	____	____	____	____	False
Severe	____	____	____	____	____	____	____	Lenient
Interesting	____	____	____	____	____	____	____	Boring
Deep	____	____	____	____	____	____	____	Shallow
Strong	____	____	____	____	____	____	____	Weak
Fast	____	____	____	____	____	____	____	Slow
Hot	____	____	____	____	____	____	____	Cold
Tense	____	____	____	____	____	____	____	Relaxed
Active	____	____	____	____	____	____	____	Passive

STOP

Do not turn page until instructed.

AVIQUSX

Kind	___	___	___	___	___	___	___	Cruel
Clean	___	___	___	___	___	___	___	Dirty
Wise	___	___	___	___	___	___	___	Foolish
True	___	___	___	___	___	___	___	False
Severe	___	___	___	___	___	___	___	Lenient
Interesting	___	___	___	___	___	___	___	Boring
Deep	___	___	___	___	___	___	___	Shallow
Strong	___	___	___	___	___	___	___	Weak
Fast	___	___	___	___	___	___	___	Slow
Hot	___	___	___	___	___	___	___	Cold
Tense	___	___	___	___	___	___	___	Relaxed
Active	___	___	___	___	___	___	___	Passive

STOP

Do not turn page until instructed.

MYSELF

Kind	___	___	___	___	___	___	___	Cruel
Clean	___	___	___	___	___	___	___	Dirty
Wise	___	___	___	___	___	___	___	Foolish
True	___	___	___	___	___	___	___	False
Severe	___	___	___	___	___	___	___	Lenient
Interesting	___	___	___	___	___	___	___	Boring
Deep	___	___	___	___	___	___	___	Shallow
Strong	___	___	___	___	___	___	___	Weak
Fast	___	___	___	___	___	___	___	Slow
Hot	___	___	___	___	___	___	___	Cold
Tense	___	___	___	___	___	___	___	Relaxed
Active	___	___	___	___	___	___	___	Passive.

STOP

Do not turn page until instructed.

APPENDIX C

Archimedes' Spiral Problem

APPENDIX C

ARCHIMEDES SPIRAL PROBLEM

Three positions A, B, and C are marked on your piece of cardborad. Take the series of five squares and arrange them, not on the cardboard but on your desk, in order of increasing size from the bottom up. The problem is to transfer the pile in the same order from one position to another moving only one square at a time and never laying a larger square upon a smaller one.

<u>Two Squares</u>

(a) Place squares 1 and 2 on A and transfer them in the same order on either B or C, in <u>three</u> moves.

(b) Transfer the two squares from A to the goal not reached in (a), in <u>three</u> moves.

<u>Three Squares</u>

(a) Place squares 1, 2, and 3 on A and transfer them in the same order to either B or C, in <u>seven</u> moves.

(b) Transfer the three squares from A to the goal not reached in (a), in <u>seven</u> moves.

<u>Four Squares</u>

(a) Place squares 1, 2, 3, and 4 on A and transfer them in the same order to either B or C, in <u>fifteen</u> moves.

(b) Transfer four squares from A to the goal not reached in (a), in <u>fifteen</u> moves.

<u>Five Squares</u>

Can you predict, <u>without moving</u> the series of five squares, the <u>minimum</u> number of moves needed to accomplish the task?

<u>Hint</u>: The rule to be applied is based on the number of moves required in moving smaller series of squares.

APPENDIX D

MEANS AND VARIANCES OF ABSOLUTE DIFFERENCE SCORES

Note:
1. All original scores were increased by one to remove zeroes.
2. All decimals are rounded to the nearest hundredth.

APPENDIX D

MEANS AND VARIANCES OF ABSOLUTE DIFFERENCE SCORES

Concept--Abstract Art

Groups	C(N=57)		FA(N=40)		SN(N=41)		SP(N=40)		SR(N=43)		ST(N=48)	
Scales	$\overline{X}$	S^2	$\overline{X}$	S^2	$\overline{X}$	S^2	$\overline{X}$	S^2	$\overline{X}$	S^2	$\overline{X}$	S^2
True-False	1.56	.86	1.93	1.20	1.90	1.24	1.82	.87	2.19	1.44	2.17	1.29
Clean-Dirty	1.63	.59	2.00	1.23	1.71	.82	1.68	.53	2.05	1.19	1.98	1.34
Kind-Cruel	1.75	.97	2.03	1.41	1.98	1.02	2.15	1.36	2.19	1.82	2.10	1.29
Wise-Foolish	2.07	1.21	2.00	1.39	2.22	1.63	2.20	1.91	2.37	1.76	2.13	1.22
Strong-Weak	1.93	1.28	2.15	1.16	2.02	1.32	2.05	.97	2.21	1.12	2.29	1.96
Interesting-Boring	1.67	1.26	1.93	1.82	1.88	1.11	1.56	.82	2.21	2.22	1.96	1.74
Severe-Lenient	1.72	.99	2.05	1.33	1.78	1.32	1.98	1.62	1.98	.88	2.10	1.97
Deep-Shallow	2.11	1.42	2.58	2.46	2.24	1.49	2.15	1.21	2.00	1.19	2.10	1.50
Active-Passive	1.93	1.35	1.95	.87	2.02	1.52	1.83	.92	2.16	1.76	2.23	1.84
Hot-Cold	1.77	1.14	2.10	1.89	2.05	1.60	1.65	.75	2.09	1.23	1.81	1.43
Fast-Slow	1.97	.89	2.40	1.99	2.37	3.05	1.98	1.15	2.28	1.59	2.54	3.06
Tense-Relaxed	1.98	.84	2.28	1.90	2.05	1.35	2.15	1.36	2.30	2.07	2.52	2.09

APPENDIX D

MEANS AND VARIANCES OF ABSOLUTE DIFFERENCE SCORES

Concept: Dreaming

Groups	C(N=57)		FA(N=40)		SN(N=41)		SP(N=40)		SR(N=43)		ST(N=48)	
Scales	$\bar{X}$	S^2	$\bar{X}$	S^2	$\bar{X}$	S^2	$\bar{X}$	S^2	$\bar{X}$	S^2	$\bar{X}$	S^2
True-False	1.83	1.33	1.54	2.08	2.00	1.15	1.90	1.63	2.23	1.28	2.08	1.61
Clean-Dirty	1.75	.87	1.68	.69	1.71	.81	1.63	.45	1.93	1.16	2.13	1.60
Kind-Cruel	1.61	.67	1.95	1.13	1.83	1.15	2.08	1.04	1.93	.92	2.08	1.65
Wise-Foolish	2.09	1.58	2.20	1.75	2.34	1.83	2.30	2.47	2.42	2.01	2.17	1.04
Strong-Weak	1.75	.80	1.98	1.15	1.95	1.35	2.08	.94	2.30	1.41	2.42	2.38
Interesting-Boring	1.53	.54	1.60	.61	1.68	1.07	1.48	.56	2.12	1.68	1.69	.81
Severe-Lenient	1.86	1.30	2.13	1.55	2.02	1.17	1.93	.79	2.42	2.11	2.02	1.68
Deep-Shallow	1.68	.68	2.10	1.53	1.68	.72	1.70	.88	2.28	1.78	2.38	1.77
Active-Passive	2.07	1.23	2.92	2.71	2.00	.97	2.61	3.31	-	-	2.60	3.52
Hot-Cold	1.68	.90	2.00	1.95	1.90	.99	2.20	2.32	1.93	1.59	1.85	1.11
Fast-Slow	1.60	.75	1.88	1.14	1.59	.75	1.43	.40	1.79	1.17	1.73	.88
Tense-Relaxed	1.81	1.27	1.90	.96	2.49	2.56	2.10	1.43	2.58	2.54	2.27	2.41

APPENDIX D

MEANS AND VARIANCES OF ABSOLUTE DIFFERENCE SCORES

Concept: Virility

Groups	C(N=57)		FA(N=40)		SN(N=41)		SP(N=40)		SR(N=43)		ST(N=48)	
Scales	$\bar{X}$	S^2	$\bar{X}$	S^2	$\bar{X}$	S^2	$\bar{X}$	S^2	$\bar{X}$	S^2	$\bar{X}$	S^2
True-False	1.63	.70	1.78	.95	1.59	.60	1.80	.67	2.09	1.13	2.17	1.16
Clean-Dirty	1.75	.87	1.98	1.00	1.73	.70	1.75	.81	1.88	1.49	1.83	.82
Kind-Cruel	1.77	.93	2.00	.97	1.54	.81	1.68	.74	1.98	1.31	2.10	1.03
Wise-Foolish	1.61	.71	2.05	1.28	1.80	.86	1.65	.59	2.32	1.94	2.04	1.15
Strong-Weak	1.51	.54	1.70	.78	2.00	1.15	1.73	.67	1.95	.95	2.29	1.36
Interesting-Boring	1.67	.62	1.93	.94	1.78	.63	1.65	.54	2.09	1.61	1.96	1.62
Severe-Lenient	1.86	1.16	1.75	.91	2.22	1.32	1.98	1.41	2.21	1.12	1.90	.78
Deep-Shallow	1.60	.82	1.78	.64	1.83	1.00	1.70	.88	2.07	2.50	1.70	.80
Active-Passive	1.60	.57	1.68	.74	1.73	.70	1.85	1.16	1.88	.77	1.85	1.32
Hot-Cold	1.68	.76	1.83	1.12	1.63	.64	1.90	1.43	1.86	1.17	1.83	1.67
Fast-Slow	1.86	1.05	2.23	1.72	1.88	1.11	2.03	1.20	2.47	2.11	2.38	1.56
Tense-Relaxed	1.79	.75	1.83	1.07	2.05	1.35	1.72	1.18	1.95	1.38	1.85	1.32

APPENDIX D

MEANS AND VARIANCES OF ABSOLUTE DIFFERENCE SCORES

Concept: Aviqusz

Groups	C(N=57)		FA(N=40)		SN(N=41)		SP(N=40)		SR(N=43)		ST(N=48)	
Scales	$\overline{X}$	S^2	$\overline{X}$	S^2	$\overline{X}$	S^2	$\overline{X}$	S^2	$\overline{X}$	S^2	$\overline{X}$	S^2
True-False	1.60	.60	1.95	.87	1.95	1.30	1.65	.75	2.09	1.47	2.04	1.49
Clean-Dirty	1.91	1.33	2.33	1.82	1.95	1.80	2.25	1.83	2.47	2.40	2.02	1.60
Kind-Cruel	1.70	.60	2.31	1.18	1.78	.82	1.89	1.28	-	-	2.55	2.16
Wise-Foolish	1.70	.91	2.15	2.46	1.94	.90	1.89	.81	-	-	2.80	3.12
Strong-Weak	1.93	1.31	2.08	.84	2.12	1.01	2.08	1.87	2.30	1.74	2.60	2.41
Interesting-Boring	1.67	.83	1.85	1.15	1.81	1.21	1.73	1.17	2.14	2.55	2.21	2.04
Severe-Lenient	2.30	1.86	2.18	1.58	2.05	2.35	2.10	2.09	2.40	2.05	2.56	2.08
Deep-Shallow	1.98	1.52	2.12	1.65	2.10	1.44	2.48	2.26	2.28	2.87	2.48	2.34
Active-Passive	1.78	1.10	2.42	1.61	2.31	1.84	2.11	1.52	-	-	3.00	2.63
Hot-Cold	1.95	1.59	2.20	1.70	2.34	1.88	2.15	1.72	2.09	1.56	2.48	2.29
Fast-Slow	2.02	1.66	2.12	1.39	1.88	1.26	2.08	1.96	1.98	2.21	2.17	2.09
Tense-Relaxed	1.88	1.29	2.15	1.62	2.05	1.80	2.08	2.23	2.07	1.97	2.75	3.04

APPENDIX D

MEANS AND VARIANCES OF ABSOLUTE DIFFERENCE SCORES

Concept: Myself

Groups	C(N=57)		FA(N=40)		SN(N=41)		SP(N=40)		SR(N=43)		ST(N=48)	
Scales	$\bar{X}$	S^2	$\bar{X}$	S^2	$\bar{X}$	S^2	$\bar{X}$	S^2	$\bar{X}$	S^2	$\bar{X}$	S^2
True-False	1.46	.50	1.78	.64	1.85	.78	1.55	.51	1.93	1.54	1.65	.53
Clean-Dirty	1.37	.49	1.50	.36	1.56	.75	1.45	.36	1.79	.88	1.50	.30
Kind-Cruel	1.42	.50	1.58	.82	1.65	.73	1.65	1.16	1.63	.76	1.63	.50
Wise-Foolish	1.58	.75	1.88	.73	1.85	.88	1.68	.84	1.93	1.83	1.50	.34
Strong-Weak	1.44	.39	1.88	.93	1.63	.74	1.48	.41	1.72	.68	1.85	1.15
Interesting-Boring	1.51	.83	1.58	.51	1.73	1.00	1.63	1.11	1.79	.69	1.58	.38
Severe-Lenient	1.54	.82	1.78	.74	1.73	.65	1.95	1.63	1.70	1.50	1.73	.84
Deep-Shallow	1.38	.28	1.53	.41	1.76	.69	1.53	.92	1.63	1.05	1.77	1.03
Active-Passive	1.37	.32	1.96	1.80	1.62	.57	2.61	3.19	-	-	2.05	2.16
Hot-Cold	1.51	.40	2.08	1.71	1.63	.79	1.70	.57	1.63	.53	1.71	1.06
Fast-Slow	1.39	.42	1.63	.90	1.63	.94	1.63	.55	1.65	.76	1.69	.73
Tense-Relaxed	1.51	.75	1.78	.95	2.46	2.51	2.08	1.82	2.42	2.92	2.94	4.06

APPENDIX E

MEANS AND VARIANCES OF SIGNED DIFFERENCE SCORES

<u>Note</u>:
1. All positive difference scores were increased by the constant 6.
2. All decimals are to nearest hundredth.

APPENDIX E

MEANS AND VARIANCES OF SIGNED DIFFERENCE SCORES

Concept: Abstract Art

Groups	C(N=56)		FA(N=40)		SN(N=40)		SP(N=40)		SR(N=43)		ST(N=48)	
Scales	$\bar{X}$	s^2	$\bar{X}$	s^2	$\bar{X}$	s^2	$\bar{X}$	s^2	$\bar{X}$	s^2	$\bar{X}$	s^2
True-False	7.09	2.41	6.98	2.49	6.95	3.18	7.35	3.26	7.07	3.69	7.25	2.45
Clean-Dirty	6.73	.93	6.65	2.13	7.10	1.32	6.78	.95	6.72	2.35	6.77	2.27
Kind-Cruel	7.02	1.21	7.13	2.06	7.05	2.15	6.90	1.63	6.70	2.79	7.08	2.67
Wise-Foolish	7.13	1.53	6.98	2.49	6.90	1.94	6.43	2.40	6.70	3.17	6.48	2.43
Strong-Weak	7.21	2.64	6.75	4.96	6.80	3.09	6.55	2.36	6.84	2.19	6.73	2.67
Interesting-Boring	7.45	1.52	6.93	2.69	6.43	1.58	6.88	1.14	6.42	3.96	6.83	2.65
Severe-Lenient	6.88	2.08	7.08	2.33	7.35	2.13	6.60	2.14	7.42	2.44	7.31	3.50
Deep-Shallow	6.82	1.46	6.90	2.45	7.00	1.95	7.00	2.67	6.72	2.30	6.60	3.05
Active-Passive	6.55	1.67	6.92	3.55	6.85	2.49	6.65	2.59	6.86	3.79	7.23	4.39
Hot-Cold	7.36	1.65	7.13	2.88	7.50	2.62	6.85	1.16	6.93	2.45	6.98	2.11
Fast-Slow	6.96	2.18	7.40	1.48	7.15	2.59	6.53	1.38	7.05	3.14	6.73	3.31
Tense-Relaxed	6.96	1.82	7.03	4.64	7.73	1.26	6.55	1.79	7.67	2.80	7.77	4.65

APPENDIX E

MEANS AND VARIANCES OF SIGNED DIFFERENCE SCORES

Concept: Dreaming

Groups	C(N=56)		FA(N=40)		SN(N=40)		SP(N=40)		SR(N=43)		ST(N=48)	
Scales	$\bar{X}$	s^2	$\bar{X}$	s^2	$\bar{X}$	s^2	$\bar{X}$	s^2	$\bar{X}$	s^2	$\bar{X}$	s^2
True-False	6.95	2.82	6.40	2.86	6.83	3.38	7.45	4.00	7.02	4.07	6.88	2.41
Clean-Dirty	6.96	1.02	6.78	1.10	6.67	1.25	6.98	.85	6.84	1.85	6.60	3.01
Kind-Cruel	7.11	1.26	6.68	2.23	6.85	2.18	6.68	2.33	6.91	2.85	6.71	2.64
Wise-Foolish	6.93	1.09	6.80	2.01	6.77	1.82	7.28	2.15	6.91	1.80	6.90	2.86
Strong-Weak	7.05	1.18	6.95	2.77	6.95	.82	6.90	1.38	6.61	3.29	7.25	3.64
Interesting-Boring	6.71	.72	6.80	.93	6.68	1.46	6.78	.74	6.49	2.68	6.94	1.29
Severe-Lenient	6.82	1.28	7.17	2.10	7.13	2.06	6.53	1.90	7.42	2.96	7.50	4.17
Deep-Shallow	7.20	2.23	7.18	2.82	6.80	2.27	6.70	1.65	6.56	3.97	7.04	2.64
Active-Passive	6.50	1.86	7.08	6.55	7.19	1.96	5.89	5.28	-	-	6.90	6.20
Hot-Cold	6.79	1.08	7.07	1.92	6.95	1.13	6.78	.54	6.77	1.75	7.15	1.40
Fast-Slow	6.77	1.35	6.83	2.92	7.25	1.78	6.55	3.59	7.09	2.47	6.98	1.85
Tense-Relaxed	7.16	1.30	7.00	1.80	7.20	4.88	6.48	2.56	7.79	4.46	7.38	4.07

APPENDIX E

MEANS AND VARIANCES OF SIGNED DIFFERENCE SCORES

Concept: Virility

Groups	C(N=56)		FA(N=40)		SN(N=40)		SP(N=40)		SR(N=43)		ST(N=48)	
Scales	$\bar{X}$	s^2	$\bar{X}$	s^2	$\bar{X}$	s^2	$\bar{X}$	s^2	$\bar{X}$	s^2	$\bar{X}$	s^2
True-False	6.82	1.06	6.35	1.98	6.90	1.58	6.90	1.02	7.14	3.60	6.92	1.99
Clean-Dirty	6.84	1.45	6.75	1.73	6.60	.91	7.15	1.36	6.77	2.23	6.79	1.49
Kind-Cruel	6.91	1.10	6.93	1.56	6.98	.99	7.20	1.29	6.63	2.14	6.92	2.55
Wise-Foolish	6.71	1.41	6.83	1.99	6.68	1.05	6.95	1.07	6.95	2.28	7.10	2.27
Strong-Weak	7.07	1.23	6.78	1.20	6.92	1.66	6.80	1.34	6.81	3.73	6.73	1.31
Interesting-Boring	6.61	1.63	6.85	1.82	6.70	1.19	6.95	.97	6.88	2.82	6.67	2.44
Severe-Lenient	6.93	.76	6.70	1.19	6.95	2.20	6.78	1.15	6.98	1.88	7.29	2.98
Deep-Shallow	7.13	1.86	6.95	1.49	7.05	2.97	6.60	1.99	6.91	2.61	7.42	1.36
Active-Passive	6.93	1.30	6.43	1.43	6.83	2.51	6.65	1.57	6.74	2.24	6.94	2.06
Hot-Cold	7.02	1.15	6.78	1.67	6.95	1.07	6.80	2.22	6.93	1.92	7.04	2.38
Fast-Slow	6.84	.97	6.83	1.17	6.85	1.26	6.65	1.77	7.28	1.78	7.29	2.00
Tense-Relaxed	7.20	1.98	6.50	3.13	7.28	1.90	6.68	2.17	7.09	3.94	7.40	3.31

APPENDIX E

MEANS AND VARIANCES OF SIGNED DIFFERENCE SCORES

Concept: Aviqusz

Groups	C(N=56)		FA(N=40)		SN(N=40)		SP(N=40)		SR(N=43)		ST(N=48)	
Scales	$\overline{X}$	S^2	$\overline{X}$	S^2	$\overline{X}$	S^2	$\overline{X}$	S^2	$\overline{X}$	S^2	$\overline{X}$	S^2
True-False	7.48	1.96	7.05	3.49	6.60	2.60	7.70	2.93	6.81	4.39	6.98	2.66
Clean-Dirty	7.27	.89	6.75	1.73	6.70	1.86	7.15	1.16	6.47	2.40	6.81	2.37
Kind-Cruel	6.77	1.07	6.58	2.57	6.53	1.23	7.61	1.31	-	-	6.45	4.37
Wise-Foolish	7.15	1.50	6.54	3.62	6.69	1.71	7.33	1.53	-	-	6.70	6.43
Strong-Weak	7.14	3.18	6.68	2.84	6.75	2.65	7.08	4.48	6.84	4.52	6.83	4.57
Interesting-Boring	6.93	1.30	7.00	1.90	6.73	1.85	6.72	1.64	6.65	3.76	7.25	3.47
Severe-Lenient	6.57	2.03	7.38	1.88	7.00	2.15	6.83	3.02	7.28	3.40	7.02	5.04
Deep-Shallow	6.98	3.40	7.28	2.92	6.83	3.74	6.63	2.96	6.54	3.83	6.77	4.52
Active-Passive	6.85	1.74	7.62	3.45	6.41	2.96	6.56	2.61	-	-	7.30	6.75
Hot-Cold	7.21	2.64	6.68	2.58	7.30	1.65	6.63	3.01	6.91	3.18	7.33	3.38
Fast-Slow	7.18	2.44	6.95	3.18	6.55	3.54	6.78	3.05	6.77	2.56	7.46	4.42
Tense-Relaxed	6.89	1.41	7.55	2.66	6.86	3.14	6.83	3.38	7.49	2.92	7.46	5.96

APPENDIX E

MEANS AND VARIANCES OF SIGNED DIFFERENCE SCORES

Concept: Myself

Groups	C(N=56)		FA(N=40)		SN(N=40)		SP(N=40)		SR(N=43)		ST(N=48)	
Scales	$\overline{X}$	S^2	$\overline{X}$	S^2	$\overline{X}$	S^2	$\overline{X}$	S^2	$\overline{X}$	S^2	$\overline{X}$	S^2
True-False	7.13	1.00	6.53	1.28	6.75	1.63	7.23	1.26	6.88	2.58	6.96	.59
Clean-Dirty	6.91	.63	6.80	.57	6.80	1.04	7.00	.56	6.72	1.44	6.88	.54
Kind-Cruel	7.05	.71	6.88	1.24	6.58	1.38	7.00	.82	6.72	2.35	6.90	.95
Wise-Foolish	7.27	.60	6.88	1.14	6.90	1.17	6.80	1.55	7.14	1.08	7.00	.89
Strong-Weak	7.20	.38	6.93	.69	7.13	1.29	6.98	1.20	6.86	1.27	7.10	1.63
Interesting-Boring	7.04	1.05	6.88	.83	7.08	1.51	6.68	1.40	7.00	1.33	7.00	.72
Severe-Lenient	7.18	.51	7.08	1.71	7.28	1.08	7.10	.66	7.21	1.17	7.19	1.86
Deep-Shallow	7.36	1.03	7.17	1.33	6.75	1.17	6.75	2.50	6.63	1.86	6.90	1.67
Active-Passive	6.96	.44	7.27	2.69	6.81	.93	5.44	3.09	-	-	7.75	2.73
Hot-Cold	6.96	.51	7.17	1.28	6.90	1.27	6.83	.92	7.09	1.18	6.94	1.21
Fast-Slow	7.05	.71	7.33	2.79	6.95	1.23	6.85	1.05	6.79	.88	7.13	1.56
Tense-Relaxed	7.13	1.02	7.13	1.55	7.90	3.99	6.13	2.22	8.37	3.05	8.71	5.11

APPENDIX F

SUMMARY OF BETWEEN-GROUP COMPARISONS OF VARIANCE F-RATIOS

Note:

How to read this table:

Where an F-ratio is underlined, this is to indicate that the variance of groups listed across the top of the table exceeds the variance of the matching group listed along the side of the table. Where no underlining occurs, the converse applies.

APPENDIX F

SUMMARY OF BETWEEN-GROUP COMPARISONS OF VARIANCE F-RATIOS

Concept: Abstract Art

True-False	SR	SN	SP	ST	FA
C	1.53	1.32	1.36	1.02	1.03
FA	1.48	1.28	1.31	1.02	
ST	1.51	1.30	1.33		
SP	1.13	1.03			
SN	1.16				

Wise-Foolish	SR	SN	SP	ST	FA
C	** 2.07	1.27	1.57	1.59	* 1.63
FA	1.27	1.28	1.03	1.03	
ST	1.31	1.25	1.01		
SP	1.32	1.24			
SN	1.63				

Clean-Dirty	SR	SN	SP	ST	FA
C	** 2.53	1.42	1.02	** 2.44	** 2.99
FA	1.10	* 1.61	** 2.25	1.06	
ST	1.04	* 1.71	** 2.39		
SP	** 2.48	1.40			
SN	* 1.78				

Strong-Weak	SR	SN	SP	ST	FA
C	1.21	1.17	1.12	1.01	* 1.88
FA	** 2.27	1.61	** 2.11	* 1.86	
ST	1.22	1.16	1.22		
SP	1.08	1.31			
SN	1.41				

Kind-Cruel	SR	SN	SP	ST	FA
C	** 2.88	* 1.77	1.34	** 2.19	* 1.61
FA	1.35	1.04	1.26	1.30	
ST	1.04	1.24	* 1.64		
SP	* 1.71	1.32			
SN	1.30				

Interesting-Boring	SR	SN	SP	ST	FA
C	** 2.60	1.04	1.36	* 1.74	* 1.76
FA	1.47	* 1.70	** 2.36	1.01	
ST	1.49	* 1.67	** 2.33		
SP	** 3.48	1.39			
SN	** 2.50				

APPENDIX F (continued)

SUMMARY OF BETWEEN-GROUP COMPARISONS OF VARIANCE F-RATIOS

Concept: Abstract Art

Severe-Lenient	SR	SN	SP	ST	FA
C	1.17	1.03	1.04	1.68*	1.12
FA	1.05	1.09	1.09	1.50	
ST	1.43	1.64*	1.63		
SP	1.14	1.01			
SN	1.15				

Hot-Cold	SR	SN	SP	ST	FA
C	1.47	1.58	1.43	1.27	1.74*
FA	1.18	1.10	2.49**	1.37	
ST	1.16	1.24	1.82**		
SP	2.17**	2.26**			
SN	1.07				

Deep-Shallow	SR	SN	SP	ST	FA
C	1.58	1.34	1.82*	2.09**	1.67*
FA	1.07	1.26	1.09	1.25	
ST	1.33	1.57	1.14		
SP	1.16	1.37			
SN	1.18				

Fast-Slow	SR	SN	SP	ST	FA
C	1.44	1.19	1.57	1.52	1.48
FA	2.13**	1.75*	1.07	2.24**	
ST	1.05	1.28	2.39**		
SP	2.27**	1.51			
SN	1.21				

Active-Passive	SR	SN	SP	ST	FA
C	2.27**	1.49	1.55	2.63**	2.13**
FA	1.07	1.43	1.37	1.23	
ST	1.16	1.76*	1.69*		
SP	1.46	1.04			
SN	1.52				

Tense-Relaxed	SR	SN	SP	ST	FA
C	1.54	2.34**	1.01	2.56**	2.55**
FA	1.66	1.09	2.59**	1.00	
ST	1.66	1.09	2.59**		
SP	1.56	2.38**			
SN	1.52				

APPENDIX F (continued)

SUMMARY OF BETWEEN-GROUP COMPARISONS OF VARIANCE F-RATIOS

Concept: Dreaming

True-False	SR	SN	SP	ST	FA
C	1.44	1.20	1.42	1.17	1.02
FA	1.42	1.18	1.40	1.19	
ST	1.69*	1.40	1.65		
SP	1.02	1.18			
SN	1.20				

Wise-Foolish	SR	SN	SP	ST	FA
C	1.66*	1.68*	1.99**	2.64**	1.85*
FA	1.17	1.10	1.07	1.42	
ST	1.59	1.57	1.33		
SP	1.20	1.18			
SN	1.01				

Clean-Dirty	SR	SN	SP	ST	FA
C	1.82*	1.23	1.20	2.96**	1.08
FA	1.68	1.14	1.30	2.73**	
ST	1.62	2.41**	3.56**		
SP	2.19**	1.48			
SN	1.48				

Strong-Weak	SR	SN	SP	ST	FA
C	2.79**	1.44	1.17	3.09**	2.35**
FA	1.19	3.38**	2.04*	1.31	
ST	1.11	4.45**	2.65**		
SP	2.40**	1.68*			
SN	4.02				

Kind-Cruel	SR	SN	SP	ST	FA
C	2.24**	1.73*	1.85*	2.09**	1.76*
FA	1.28	1.02	1.05	1.19	
ST	1.08	1.21	1.13		
SP	1.22	1.07			
SN	1.31				

Interesting-Boring	SR	SN	SP	ST	FA
C	3.74**	2.03**	1.04	1.80*	1.30
FA	2.88**	1.56	1.26	1.39	
ST	2.07**	1.13	1.47		
SP	3.61**	1.96*			
SN	1.84*				

APPENDEX F (continued)

Concept: Dreaming

Severe-Lenient	SR	SN	SP	ST	FA
C	2.32**	1.61*	1.49	3.35**	1.64*
FA	1.41	1.02	1.11	1.99**	
ST	1.41	2.02**	2.20**		
SP	1.56	1.09			

Hot-Cold	SR	SN	SP	ST	FA
C	1.62*	1.16	2.09**	1.29	1.77*
FA	1.09	1.70	3.56**	1.37	
ST	1.25	1.25	2.61**		
SP	3.26**	2.09			

Deep-Shallow	SR	SN	SP	ST	FA
C	1.78*	1.02	1.40	1.18	1.26
FA	1.41	1.24	1.25	1.07	
ST	1.50	1.16	1.60		
SP	2.40**	1.37			
SN	1.75*				

Fast-Slow	SR	SN	SP	ST	FA
C	1.84*	1.32	2.66**	1.38	2.17**
FA	1.18	1.64	1.23	1.58	
ST	1.33	1.04	1.94		
SP	1.45	2.01*			
SN	1.38				

Active-Passive	SR	SN	SP	ST	FA
C		1.06	2.84	3.33	3.52
FA		3.34**	1.24	1.06	
ST		3.16**	1.17		
SP		2.69**			
SN					

Tense-Relaxed	SR	SN	SP	ST	FA
C	3.42	3.75	1.97	3.13	1.38
FA	2.48**	2.72**	1.43	2.27**	
ST	1.09	1.20	1.59		
SP	1.74*	1.90*			
SN	1.10				

APPENDIX F (continued)

Concept: Virility

True-False	SR	SN	SP	ST	FA
C	3.40**	1.49	1.14	1.88*	1.87*
FA	1.82*	1.25	1.95*	1.01	
ST	1.81*	1.26	1.96*		
SP	3.55**	1.56			
SN	2.28				

Wise-Foolish	SR	SN	SP	ST	FA
C	1.62*	1.35	1.31	1.61*	1.41
FA	1.14	1.91*	1.36*	1.14	
ST	1.01	2.17**	2.11**		
SP	2.13**	1.03			
SN	2.18**				

Clean-Dirty	SR	SN	SP	ST	FA
C	1.54	1.58	1.06	1.03	1.20
FA	1.29	1.90*	1.27	1.16	
ST	1.50	1.63	1.09		
SP	1.64	1.49			
SN	2.44**				

Strong-Weak	SR	SN	SP	ST	FA
C	3.03**	1.35	1.09	1.06	1.02
FA	3.09**	1.38	1.17	1.09	
ST	2.85	1.27	1.03		
SP	2.77**	1.24			
SN	2.44**				

Kind-Cruel	SR	SN	SP	ST	FA
C	1.95*	1.10	1.17	2.31**	1.41
FA	1.38	1.56	1.21	1.63	
ST	1.19	2.55**	1.97*		
SP	1.66	1.29			
SN	2.15**				

Interesting Boring	SR	SN	SP	ST	FA
C	1.74*	1.37	1.67	1.50	1.12
FA	1.55	1.53	1.88*	1.34	
ST	1.16	2.05**	2.51**		
SP	2.90**	1.22			
SN	2.37**				

APPENDIX F (continued)

Concept: Virility

Severe-Lenient	SR	SN	SP	ST	FA
C	2.48**	2.91**	1.52	3.93**	1.57
FA	1.58	1.85*	1.03	2.50**	
ST	1.58	1.35	2.58**		
SP	1.63	1.91*			
SN	1.17				

Hot-Cold	SR	SN	SP	ST	FA
C	1.68*	1.06	1.93*	2.08**	1.45
FA	1.54	1.55	1.33	1.43	
ST	1.24	2.22**	1.07		
SP	1.15	2.06*			
SN	1.79*				

Deep-Shallow	SR	SN	SP	ST	FA
C	1.41	1.60	1.07	1.37	1.25
FA	1.76*	2.00*	1.34	1.10	
ST	1.93*	2.19**	1.47		
SP	1.31	1.49			
SN	1.14				

Fast-Slow	SR	SN	SP	ST	FA
C	1.82*	1.29	1.82*	2.05**	1.21
FA	1.51	1.07	1.51	1.70*	
ST	1.12	1.59	1.13		
SP	1.00	1.41			
SN	1.41				

Active-Passive	SR	SN	SP	ST	FA
C	1.72*	1.92*	1.20	1.58	1.10
FA	1.57	1.75*	1.10	1.44	
ST	1.09	1.22	1.31		
SP	1.43	1.60			
SN	1.18				

Tense-Relaxed	SR	SN	SP	ST	FA
C	1.99**	1.04	1.10	1.67*	1.58
FA	1.26	1.65	1.44	1.06	
ST	1.19	1.74*	1.52		
SP	1.81*	1.15			
SN	2.08**				

APPENDIX F (continued)

Concept: Aviqusx

True-False	SR	SN	SP	ST	FA
C	2.24**	1.33	1.49	1.77*	3.40**
FA	1.26	1.34	1.19	1.31	
ST	1.65*	1.02	1.10		
SP	1.67*	1.12			
SN	1.68*				

Wise-Foolish	SR	SN	SP	ST	FA
C	--	1.14	1.02	4.30**	2.42*
FA	--	2.12*	2.37*	1.78	
ST	--	3.77**	4.21**		
SP	--	1.12			
SN	--				

Clean-Dirty	SR	SN	SP	ST	FA
C	2.69**	2.08**	1.29	2.66**	1.94
FA	1.40	1.08	1.57	1.37	
ST	1.03	1.20	2.04**		
SP	2.04*	1.61			
SN	1.29				

Strong-Weak	SR	SN	SP	ST	FA
C	1.42	1.20	1.41	1.44	1.11
FA	1.59	1.07	1.58	1.63	
ST	1.01	1.76*	1.05		
SP	1.01	1.69*			
SN	1.70*				

Kind-Cruel	SR	SN	SP	ST	FA
C	--	1.15	1.23	4.09**	2.42**
FA	--	2.10*	1.96	1.70	
ST	--	3.50**	3.33**		
SP	--	1.07			
SN	--				

Interesting-Boring	SR	SN	SP	ST	FA
C	2.88**	1.41	1.26	2.66**	1.45
FA	1.98*	1.03	1.16	1.33*	
ST	1.08	1.86*	2.12**		
SP	2.29**	1.12			
SN	2.03*				

APPENDIX F (continued)

Concept: Aviqusx

Severe-Lenient	SR	SN	SP	ST	FA
C	1.67*	1.07	1.48	2.48**	1.07
FA	1.81*	1.14	1.62	1.68**	
ST	1.49	2.34**	1.67*		
SP	1.12	1.42			
SN	1.58				

Hot-Cold	SR	SN	SP	ST	FA
C	1.20	1.61	1.13	1.28	1.03
FA	1.12	1.72*	1.06	1.19	
ST	1.06	2.04**	1.81*		
SP	1.06	1.82*			
SN	1.93*				

Deep-Shallow	SR	SN	SP	ST	FA
C	1.13	1.10	1.15	1.33	1.25
FA	1.31	1.28	1.08	1.55	
ST	1.18	1.21	1.53		
SP	1.30	1.27			
SN	1.03				

Fast-Slow	SR	SN	SP	ST	FA
C	1.05	1.45	1.25	1.81*	1.30
FA	1.24	1.12	1.06	1.39	
ST	1.73*	1.25	1.47		
SP	1.19	1.17			
SN	1.38				

Active-Passive	SR	SN	SP	ST	FA
C	--	1.71	1.51	3.89**	1.99*
FA	--	1.16	1.32	1.96	
ST	--	2.26*	2.56**		
SP	--	1.13			
SN	--				

Tense-Relaxed	SR	SN	SP	ST	FA
C	2.08**	2.23**	2.40**	4.24**	1.89*
FA	1.11	1.18	1.24	2.26	
ST	2.04**	1.90*	1.77*		
SP	1.15	1.08			
SN	1.07				

APPENDIX F (continued)

Concept: Myself

True-False	SR	SN	SP	ST	FA
C	2.36**	1.49	1.15	1.84*	1.17
FA	2.02*	1.26	1.02	2.16**	
ST	4.35**	2.72**	2.11**		
SP	2.24**	1.29			
SN	1.59				

Wise-Foolish	SR	SN	SP	ST	FA
C	1.79*	1.95*	2.58**	1.49	1.89*
FA	1.06	1.03	1.36	1.27	
ST	1.20	1.31	1.73*		
SP	1.44	1.32			
SN	1.09				

Clean-Dirty	SR	SN	SP	ST	FA
C	2.29**	1.65*	1.12	1.17	1.10
FA	2.50**	1.81*	1.02	1.07	
ST	2.68**	1.93*	1.05		
SP	2.56**	1.84*			
SN	1.39				

Strong-Weak	SR	SN	SP	ST	FA
C	3.34**	3.41**	3.18**	4.29**	1.81*
FA	1.84*	1.88*	1.75*	2.37**	
ST	1.29	1.26	1.35		
SP	1.05	1.07			
SN	1.02				

Kind-Cruel	SR	SN	SP	ST	FA
C	3.33**	1.95*	1.17	1.34	1.76*
FA	1.89*	1.11	1.51	1.31	
ST	2.48**	1.46	1.15		
SP	2.86**	1.68*			
SN	1.71*				

Interesting-Boring	SR	SN	SP	ST	FA
C	1.26	1.43	1.33	1.45	1.27
FA	1.61	1.82*	1.69*	1.15	
ST	1.84*	2.08**	1.94*		
SP	1.05	1.07			
SN	1.13				

APPENDIX F (continued)

Concept: Myself

Severe-Lenient	SR	SN	SP	ST	FA
C	2.88**	2.10**	1.27	3.62**	3.34**
FA	1.46	1.59	2.61**	1.09	
ST	1.59	1.73*	2.83**		
SP	1.78*	1.64			
SN	1.09				

Hot-Cold	SR	SN	SP	ST	FA
C	2.33**	2.50**	1.80*	2.36**	2.51**
FA	1.08	1.00	1.39	1.06	
ST	1.02	1.05	1.32		
SP	1.29	1.39			
SN	1.08				

Deep-Shallow	SR	SN	SP	ST	FA
C	1.79*	1.13	2.41**	1.62*	1.28
FA	1.40	1.14	1.88*	1.26	
ST	1.11	1.43	1.50		
SP	1.35	2.14**			
SN	1.59				

Fast-Slow	SR	SN	SP	ST	FA
C	1.25	1.74*	1.49	2.21**	3.95**
FA	3.15**	2.27**	2.65**	1.79*	
ST	1.76*	1.27	1.48		
SP	1.19	1.17			
SN	1.39				

Active-Passive	SR	SN	SP	ST	FA
C	--	2.13*	7.05**	6.22**	6.13**
FA	--	2.89**	1.16	1.03	
ST	--	2.96**	1.12		
SP	--	3.32**			
SN	--				

Tense-Relaxed	SR	SN	SP	ST	FA
C	2.99**	3.91**	1.73*	5.00**	1.52
FA	1.97*	2.58**	1.43	3.30**	
ST	1.67*	1.28	2.30**		
SP	1.38	1.98*			
SN	1.31				

APPENDIX G

Summaries by Dimensions of One Way Analysis of Variance and Newman-Keuls Comparisons of Treatment Means

APPENDIX G

SUMMARIES BY DIMENSIONS OF ONE WAY ANALYSIS OF VARIANCE AND NEWMAN-KEULS COMPARISONS OF TREATMENT MEANS

A. Evaluative Dimension

Concept	Scales	Source of Variation	S.S.	df	M.S.	F	P	Comparison of Means
Abst Art	Tr-Fal	Groups	13.66	5	2.73	2.40	.04	ST>C**; FA,SR>C*
		Error	299.37	263	1.14			
	Cle-Di	Groups	8.06	5	1.61	1.71	.13	
		Error	247.41	263	0.94			
	Ki-Cru	Groups	6.30	5	1.26	0.94	.43	
		Error	340.60	263	1.30			
	Wi-Fool	Groups	3.69	5	0.74	0.49	.78	
		Error	392.44	263	1.49			
Dreaming	Tr-Fal	Groups	5.35	5	1.07	0.75	.58	
		Error	373.56	263	1.42			
	Cle-Di	Groups	8.09	5	1.62	1.71	.13	ST> SP (app)
		Error	249.24	263	0.95			
	Ki-Cru	Groups	7.84	5	1.57	1.45	.21	
		Error	284.44	263	1.08			
	Wi-Fool	Groups	3.58	5	0.72	0.41	.84	
		Error	459.71	263	1.75			
Virility	Tr-Fal	Groups	13.24	5	2.65	3.04	.01	ST>C**,SN** ;ST>FA(app) SR>C*, SN*
		Error	228.88	263	0.87			
	Cle-Di	Groups	1.90	5	0.38	0.40	.85	
		Error	248.17	263	0.94			
	Ki-Cru	Groups	10.29	5	2.06	2.13	.06	FA,ST>SN* ;SR>SN(app)
		Error	254.46	263	0.97			
	Wi-Fool	Groups	17.18	5	3.44	3.20	.008	FA,SR>C** ;ST>C* ; SR>SP**
		Error	282.31	263	1.07			

A. Evaluative Dimension (con.)

Concept	Scales	Source of Variation	S.S.	df	M.S.	F	P	Comparison of Means
Avi-quisx	Tr-Fal	Group	10.28	5	2.06	1.93	.09	SR,ST>C (app)
		Error	280.17	263	1.07			
	Cl-Dir	Group	11.50	5	2.30	1.30	.26	
		Error	464.42	263	1.77			
	Ki-Cru	Group	12.60	4	3.15	2.79	.03	ST>C*; ST>SN*
		Error	133.36	118	1.13			
	Wi-Fool	Group	15.61	4	3.90	2.48	.05	ST>C*; ST>SP(app)
		Error	185.87	118	1.58			
Myself	Tr-Fal	Group	7.86	5	1.57	2.13	.06	SN,SR>C*; SR>SP(app)
		Error	193.91	263	0.74			
	Cl-Dir	Group	4.76	5	0.95	1.84	.11	SR>C*; SR>SP(app)
		Error	136.38	263	0.52			
	Ki-Cru	Group	2.08	5	0.42	0.58	.72	
		Error	189.29	263	0.72			
	Wi-Fool	Group	7.13	5	1.43	1.62	.15	
		Error	230.96	263	0.88			

B. Potency Dimension

Concept	Scales	Source of Variation	S.S.	df	M.S.	F	P	Comparison of Means
Abst-ract	Str-Wea	Group	4.36	5	0.87	0.66	.65	
		Error	346.73	263	1.32			
	Int-Bor	Group	11.27	5	2.25	1.51	.19	
		Error	392.64	263	1.49			
	Sev-Len	Group	5.65	5	1.13	0.84	.52	
		Error	352.86	263	1.34			
	De-Shal	Group	8.42	5	1.68	1.10	.36	
		Error	402.28	263	1.53			

B. Potency Dimension (con.)

Con-Cept	Scales	Source of Varia-tion	S.S.	df	M.S.	F	P	Comparison of Means
Drea-ming	Str-Wea	Group	14.71	5	2.94	2.20	.05	ST>C*; SR>C*
		Error	350.96	263	1.33			
	Int-Bor	Group	11.47	5	2.29	2.65	.02	SR>C**; SP**, FA*, SN*, ST*
		Error	227.39	263	0.86			
	Sev-Len	Group	8.82	5	1.76	1.23	.30	
		Error	378.45	263	1.44			
	De-Shal	Group	23.60	5	4.72	3.39	.002	ST>C**, ST>SN**, ST>SP*
		Error	319.10	263	1.21			
Viri-lity	Str-Wea	Group	18.90	5	3.78	4.20	.001	ST>C**,FA**,SP*,SN>C* SR>C (app)
		Error	236.44	263	0.90			
	Int-Bor	Group	7.02	5	1.40	1.41	.22	
		Error	261.11	263	0.99			
	Sev-Len	Group	7.89	5	1.58	1.42	.22	
		Error	291.97	263	1.11			
	De-Shal	Group	6.10	5	1.22	1.12	.35	
		Error	287.61	263	1.09			
Avi-quisx	Str-Wea	Group	13.87	5	2.77	1.80	.11	ST>C*
		Error	406.21	263	1.54			
	Int-Bor	Group	11.83	5	2.37	1.60	.16	
		Error	389.26	263	1.48			
	Sev-Len	Group	8.34	5	1.67	0.84	.53	
		Error	525.30	263	2.00			
	De-Shal	Group	10.14	5	2.03	1.01	.41	
		Error	525.57	263	2.00			

APPENDIX G (continued)

B. Potency Dimension (con.)

Concept	Scales	Source of Variation	S.S	df	M.S.	F	P	Comparison of Means
Myself	Str-Wea	Group	8.01	5	1.60	2.26	.05	ST>C**;FA>C* FA,ST>SP (app)
		Error	186.53	263	0.71			
	Int-Bor	Group	2.60	5	0.52	0.70	.63	
		Error	196.23	263	0.75			
	Sev-Len	Group	4.03	5	0.81	0.79	.56	
		Error	267.61	263	1.02			
	De-Shal	Group	5.47	5	1.09	1.54	.18	
		Error	187.55	263	0.71			

C. Activity Dimension

Concept	Scales	Source of Variation	S.S	df	M.S.	F	P	Comparison of Means
Abstract	Act-Pas	Group	5.16	5	1.03	0.74	.59	
		Error	366.71	263	1.39			
	Hot-Cold	Group	7.91	5	1.58	1.19	.31	
		Error	349.58	263	1.33			
	Fas-Slo	Group	12.59	5	2.52	1.31	.26	
		Error	505.12	263	1.92			
	Te-Rela	Group	9.33	5	1.87	1.19	.32	
		Error	413.01	263	1.57			
Dreaming	Ac-Pas	Group	16.70	4	4.18	1.95	.11	
		Error	252.78	118	2.14			
	Hot-Cold	Group	6.76	5	1.35	0.95	.45	
		Error	375.10	263	1.43			
	Fas-Slo	Group	5.47	5	1.09	1.29	.27	
		Error	222.42	263	0.85			
	Te-Rela	Group	22.52	5	4.50	2.44	.04	SR>C*,FA*;ST>C*; SN>C (app)
		Error	486.27	263	1.85			

C. Activity Dimension (con.)

Concept	Scales	Source of Variation	S.S.	df	M.S.	F	P	Comparison of Means
Virility	Act-Pas	Group	3.25	5	0.65	0.75	.59	
		Error	228.04	263	0.87			
	Hot-Cld	Group	2.46	5	0.49	0.44	.82	
		Error	295.03	263	1.42			
	Fa-Slow	Group	15.28	5	3.06	2.12	.06	SR>C*; SR>SN (app) ST>C (app)
		Error	379.17	263	1.44			
	Te-Rela	Group	2.90	5	0.58	0.50	.77	
		Error	303.01	263	1.15			
Aviqusx	Act-Pas	Group	18.20	4	4.55	2.66	.04	ST>C**,ST>SP)app)
		Error	201.67	118	1.71			
	Hot-Cld	Group	8.78	5	1.76	0.98	.43	
		Error	471.17	263	1.79			
	Fa-Slow	Group	2.38	5	0.48	0.27	.93	
		Error	466.17	263	1.77			
	Te-Rela	Group	22.42	5	4.48	2.27	.05	ST>C**,SN*; ST>SP, SR (app)
		Error	519.71	263	1.98			
My-Self	Act-Pas	Group	19.38	4	4.85	3.44	.01	SP>C**,SN**;FA, ST>C (app)
		Error	165.99	118	1.41			
	Hot-Cld	Group	8.11	5	1.62	1.98	.08	FA>C*; FA>SN,SR(app)
		Error	214.90	263	0.82			
	Fa-Slow	Group	3.17	5	0.63	0.91	.48	
		Error	183.85	263	0.70			
	Te-Rela	Group	65.97	5	13.19	6.16	.00	SN,SR,ST>C**;ST>FA** SN,SR>FA*;SP>C*; ST>SP*
		Error	563.47	263	2.14			

* (.05 level)
** (.01 level)
app (approaching significance)